WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, SL3 0DG
Tel 01753 810 999, Fax 01753 681 442

SUMMARY

Unable to survey any further than 5.1m due to a very high water level.
See section 7 for re-survey after high pressure water jetting

Section 4 SN: 33255

PETER DEER AND ASSOCIATES

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, Slough SL3 0DG
Tel. 01753 810 999, Fax. 01753 681 442

Inspection report

Date:	Job N°	Weather	Operator	section number	PLR
28/09/2009	33255	Dry	DAVE SMOOTHY	5	MH.O X
Present:	Vehicle: HX07 BKJ	Camera: FLEXI-PROBE	Preset:	Cleaned: No	Grade:

Road:	MARESFIELD GARDENS	Division:	-	start MH:	MH.O
Place:	LONDON	District:	-	end MH:	VIEW
Location:	FRONT GARDEN	Tape No.:	1	Total length:	0 m

Purpose:		Shape/Size:	Circular 150
Use:	Combined	Material:	Vitrified clay Pipe length:
Catchment:	-	Lining:	
		Category:	

Comment: BLOCKAGE I C TRAP
Location details:

1:25	position	code	observation
Depth: 04.20			
VIEW	0.00	ST	Start of Survey
	0.00	MH	Manhole Remark: MH.O
	0.00	WL	Water level, 100 % height/diameter
	0.00	GO	General Observation, Remark: BLOCKAGE AT I C TRAP
	0.00	FH	Finish Survey

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, SL3 0DG
Tel: 01753 610 999, Fax: 01753 681 442

SUMMARY

Note: - Overview of the chamber at MH.O before the blockage was cleared at the interceptor trap. In addition the bolts could not be replaced at MH10, as they were seized and had to be forced out.

Section 5 SN: 33255

PETER DEER AND ASSOCIATES

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, Slough SL3 0DG
Tel: 01753 610 999, Fax: 01753 681 442

Inspection report

Date:	Job N°:	Weather:	Operator:	section number:	PLR:
28/09/2009	33255	Dry	DAVE SMOOTHY	5	MH.O X
Present:	Vehicle: HX07 BKJ	Camera: FLEXI-PROBE	Preset:	Cleaned: No	Grade:

Road:	MARESFIELD GARDENS	Division:	-	start MH:	MH.O
Place:	LONDON	District:	-	end MH:	MAIN SEWER
Location:	FRONT GARDEN	Tape No:	1	Total length:	6.8 m

Purpose:		Shape/Size:	Circular 100
Use:	Combined	Material:	Vitrified clay Pipe length:
Catchment:	-	Lining:	
		Category:	

Comment:

Location details:

1:50	position	code	observation
Depth: 04.20			
MH.O	0.00	ST	Start of Survey
	0.00	MH	Manhole Remark: MH.O
	0.00	WL	Water level: 6 % height/diameter
	0.40	S1 DEG	Debris grease, from 07 to 05 o clock, 5 % cross-sectional area loss Start
	0.80	GO	General Observation, Remark: VIEW OF I C TRAP
	0.70	S2 ESL	Light Scale from 05 to 07 o'clock, Start
	1.00	DC	Dimension of sewer changes, new dimension dia 150 mm
	1.30	CCJ	Circumferential Crack at joint, from 11 to 03 o'clock
	1.30	FMJ	Multiple Fractures at joint from 10 to 02 o'clock
	2.20	CC	Circumferential Crack, from 03 to 05 o'clock
	6.50	GO	General Observation, Remark: SEWER FLAP
	6.50	F1 DEG	Debris grease, from 07 to 05 o clock, 5 % cross-sectional area loss Finish
	6.50	F2 ESL	Light Scale from 05 to 07 o'clock, Finish
	6.80	GO	General Observation, Remark: MAIN SEWER REACHED
MAIN SEWER	6.80	FM	Finish Survey

1.3 m //

Structural Defects
'Service'Defects
Connectional Features
Miscellaneous Features

PETER DEER AND ASSOCIATES

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, Slough SL3 0DG
Tel: 01753 810 999, Fax: 01753 681 442

Inspection photos

Place:	Road:	Date	section number	PLR:
LONDON	MARESFIELD GARDENS	28/09/2009	6	MH.O X

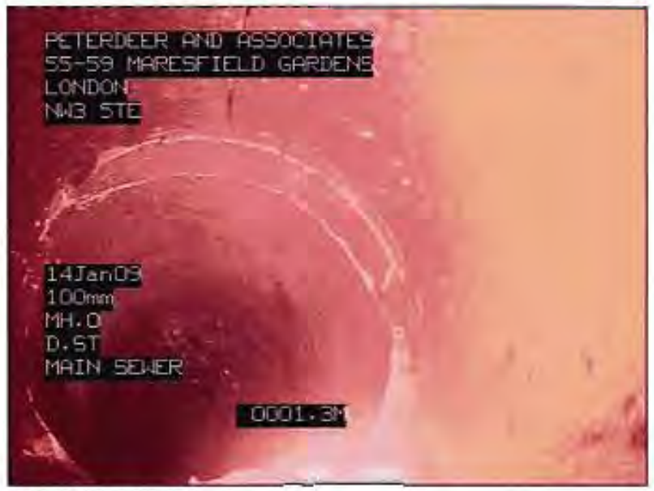

Photo: 50_9a, Tape No.: 1
1.3m, Multiple Fractures at joint from 10 to 02 o'clock

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, SL3 0DG
Tel: 01753 810 999, Fax: 01753 681 442

SUMMARY

Specific defects: - Multiple fractures at 1.3m with cracks at 1.3m and 2.2m. Also light scale deposits from 0.7m to 6.5m, with debris grease deposits from 0.4m to 6.5m

Recommend repairs to structural defects as identified by CCTV Survey.

Section 6 SN: 33255

PETER DEER AND ASSOCIATES

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, Slough SL3 0DG
Tel: 01753 810 999, Fax: 01753 681 442

Inspection report

Date	Job N°	Weather	Operator	section number	PLR
28/09/2009	33265	Dry	DAVE SMOOTHY	7	MH.N X
Present	Vehicle: HX07 BKJ	Camera: FLEXI-PROBE	Preset	Cleaned: Yes	Grade

Road:	MARESFIELD GARDENS	Division:	-	start MH:	MH.N
Place:	LONDON	District:	-	end MH:	MH.O
Location:	FRONT GARDEN	Tape No:	1	Total length:	6.7 m

Purpose:		Shape/Size:	Circular 150
Use:	Combined	Material:	Vitrified clay Pipe length:
Catchment:	-	Lining:	
		Category:	

Comment: CLEARED BOCKAGE AT I C TRAP

Location details:

1:50	position	code	observation
Depth: 03.06			
MH.N	0.00	ST	Start of Survey
	0.00	MH	Manhole Remark: MH.N
	0.00	WL	Water level, 05 % height/diameter
	0.60	CC	Circumferential Crack, from 04 to 06 o'clock
	0.60	FC	Circumferential Fracture, from 07 to 10 o'clock
	0.60	FC	Circumferential Fracture, from 02 to 05 o'clock
	0.60	CC	Circumferential Crack, from 09 to 11 o'clock
	4.00	ESL	Light Scale from 04 to 07 o'clock
	4.70	CC	Circumferential Crack, from 01 to 05 o'clock
	5.60	DEG	Debris grease, from 11 to 01 o'clock, 5 % cross-sectional area loss
	5.90	DEG	Debris grease, from 04 to 08 o'clock, 5 % cross-sectional area loss
	6.20	FC	Circumferential Fracture, from 08 to 04 o'clock
	6.20	CC	Circumferential Crack, from 11 to 01 o'clock
	6.30	CC	Circumferential Crack, from 09 to 11 o'clock
	6.70	MH	Manhole Remark: MH.O
MH.O	6.70	FH	Finish Survey

0.6 m //

6.2 m //

Structural Defects	Construction Features
Service Defects	Miscellaneous Features

PETER DEER AND ASSOCIATES

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, Slough SL3 0DG
Tel: 01753 810 999, Fax: 01753 681 442

Inspection photos

Place:	Road:	Date:	section number:	PLR:
LONDON	MARESFIELD GARDENS	28/09/2009	7	MH.N X

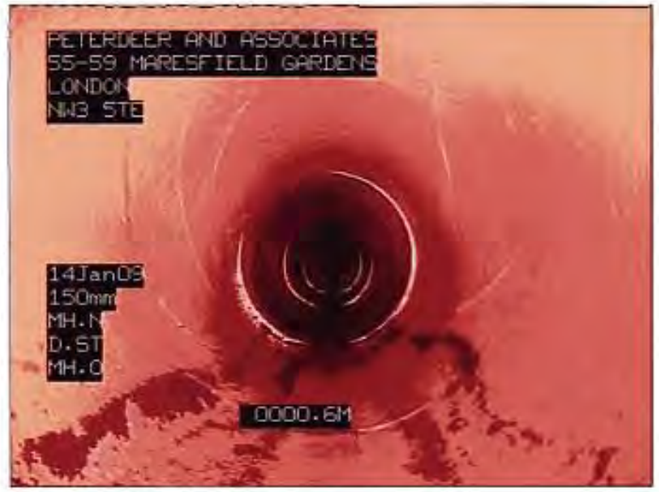

Photo: 59_5a, Tape No.: 1
0.6m, Circumferential Fracture, from 07 to 10 o'clock

Photo: 64_12a, Tape No.: 1
6.2m, Circumferential Fracture, from 08 to 04 o'clock

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, SL3 0DG
Tel: 01753 610 999, Fax: 01753 681 442

SUMMARY

Specific defects: - Fractured pipe work at 0.6m and 6.2m, with cracks at 0.6m, 4.7m, 6.2m and 6.3m. Also with light scale deposits at 4.0m and debris grease at 5.6m and 5.9m

Recommend repairs to structural defects as identified by CCTV Survey

Section 7 SN: 33255

PETER DEER AND ASSOCIATES

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, Slough SL3 0DG
Tel: 01753 610 999, Fax: 01753 681 442

Inspection report

Date	Job N°:	Weather:	Operator:	section number:	PLR
28/09/2009	33255	Dry	DAVE SMOOTHY	8	BR.1 X
Present:	Vehicle: HX07 BKJ	Camera: FLEXI-PROBE	Preset:	Cleaned: Yes	Grade:

Road:	MARESFIELD GARDENS	Division:	-	start MH:	MH.0
Place:	LONDON	District:	-	end MH:	BR.1
Location:	FRONT GARDEN	Tape No.:	1	Total length:	0.7 m

Purpose:
Use: VENT
Catchment: -
Shape/Size: Circular 100
Material: Vitrified clay Pipe length:
Lining:
Category:

Comment: HIGH LEVEL
Location details:

1:25	position	code	observation
Depth: 04.20			
MH.0	0.00	ST	Start of Survey
	0.00	MH	Manhole Remark: MH.0
	0.00	WL	Water level, 0 % height/diameter
	0.40	FC	Circumferential Fracture, from 07 to 04 o'clock
	0.50	LL	Line of Sewer deviates left, Remark: SLIGHT
BR.1	0.70	ESM	Medium Scale from 04 to 08 o'clock, 15% cross-sectional area loss, Remark: BASE OF VENT
	0.70	GO	General Observation, Remark: BASE OF VENT
	0.70	FH	Finish Survey

0.4 m //

Structural Defects | Construction Features
Service Defects | Miscellaneous Features

PETER DEER AND ASSOCIATES

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, Slough SL3 0DG
Tel: 01753 810 999, Fax: 01753 681 442

Inspection photos

Place	Road	Date	section number	PLR
LONDON	MARESFIELD GARDENS	28/09/2009	8	BR.1 X

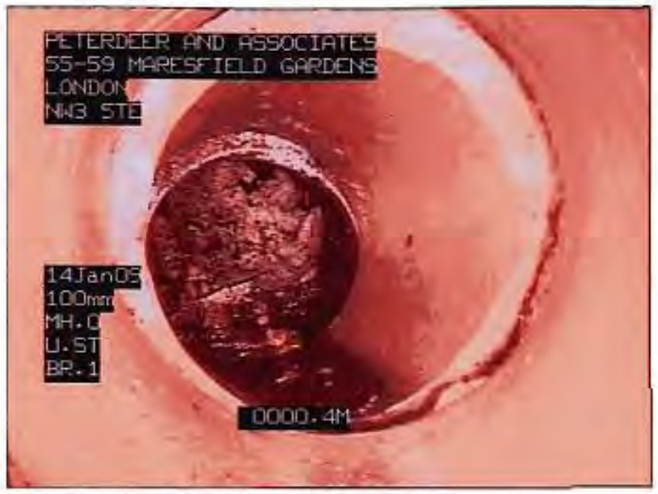

Photo: 72_4a, Tape No.: 1
0.4m, Circumferential Fracture, from 07 to 04 o'clock

WATERFLOW Plc

Waterflow Plc
12-16 David Road, Poyle Trading Estate
Colnbrook, SL3 0DG
Tel: 01753 810 999, Fax: 01753 681 442

SUMMARY

Specific defects: - Fractured pipe work at 0.4m with scale deposits at 0.7m

Recommend repairs to structural defects as identified by CCTV Survey

Section 8 SN: 33255

Appendix D: Water Environment Ltd Surface Water Assessment

surface water assessment

elliottwood

59 Maresfield Gardens

Camden

London

NW3 5TE

Surface Water Assessment

project no. WE11092

revision: P1

Document Control

issue no.	01	remarks:	Planning application for development at 59 Maresfield Gardens				
revision:	P1	prepared by:	Niall Greenan	checked by:	Guy Laister	approved by:	Guy Laister
date:	December 2011	signature:		signature:		signature:	

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Drawing 1- Topographic Survey
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Drawing 3- Proposed Basement Layout

Executive Summary

The site is located at the northern end of Maresfield Gardens on the western side of the road near the junction of Netherhall Gardens. The property is located at the northern end of a terrace of three houses. The site ground levels fall down from east to west with the rear garden a storey lower than the front entrance drive.

Proposals are for revisions to the external design with the construction of a new house comprising lower ground, upper ground and first floor level light wells to front and rear. It has been proposed that the existing combined drainage will remain however a 50% reduction of the present discharge rate will be implemented.

The latest online Environment Agency flood zone maps indicate that the site is located in Flood Zone 1 (low risk), and the site is less than 1 hectare in area. In accordance with PPS25, a flood risk assessment is not required for the site. Local policy guidance on basement developments specifies that all new basement developments located in borough-defined areas at risk of surface water flooding need to be accompanied by a flood risk assessment. The site is not located in an area defined as being at risk of surface water flooding.

All sources of flooding have been assessed and are considered to pose a negligible risk to the site. While large areas in the north of the borough were affected by surface water and sewer flooding in 1975 and 2002, the site itself was unaffected in either event. The risk of surface water and sewer flooding are therefore considered to be low in this region of Camden.

The proposed basement is at a low risk of flooding from all sources, and the proposed basement is considered acceptable in the context of flood risk. Furthermore, surface water runoff from the site will not increase following development due to additional storage, and there will be no increase in flood risk elsewhere in the borough as a result of the development.

1.0 Introduction

General Information

1.1 The site is located at the northern end of Maresfield Gardens on the western side of the road near the junction of Netherhall Gardens. The property is located at the northern end of a terrace of three houses. The site ground levels fall from east to west with the rear garden a storey lower than the front entrance drive.

1.2 The site is shown in Flood Zone 1 of the latest Environment Agency Flood Zone maps, and by definition the risk of flooding from fluvial and tidal sources is less than 0.1% in any year. The site is less than 1ha, and therefore a full flood risk assessment is not required by Planning Policy Statement 25[1].

1.3 The London Borough of Camden policy dictates that surface water and flood risk is considered in this case primarily due to basement construction. This Surface Water Impact assessment has been produced to assess the risks of flooding from other potential sources such as overland flow, groundwater, artificial water bodies and underground sewers. The impact of the proposed development on surface water infrastructure is considered, to form part of the Basement Impact Assessment.

Planning Policy

1.4 As part of the Local Development Framework (LDF), Camden adopted the Core Strategy and Development Policies in November 2010. Policy CS13 relates to flood risk and states:

1.5 "Water and surface water flooding "

We will make Camden a water efficient borough and minimise the potential for surface water flooding by:

•protecting our existing drinking water and foul water infrastructure, including Barrow Hill Reservoir, Hampstead Heath Reservoir, Highgate Reservoir and Kidderpore Reservoir;

• making sure development incorporates efficient water and foul water infrastructure;

• requiring development to avoid harm to the water environment, water quality or drainage systems and prevents or mitigates local surface water and down-stream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross (see Map 1)."

1.6 The Development Policies also include a policy specific to basements as follows:

DP27 – Basements and Lightwells

1.7 "...The Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability...."

1.8 The London Borough of Camden has strict policies with regards to basement development within the Borough, therefore they have provided guidelines for "New basement developments and extensions to existing basement accommodation[2]". Formal planning guidance has also been released[3] setting out specific criteria for assessing the impact of basement construction. As part of the Basement Impact Assessment (BIA), it is necessary to consider "Surface flow and flooding". A screening flowchart addresses individual sources of potential flooding, and where a risk of flooding is present, a scoping and impact assessment need to be undertaken as appropriate. This report covers this component of the BIA.

1.9 In conjunction with ARUP, the London Borough of Camden produced a "geological, hydrogeological and hydrological study for guidance on subterranean development[4]".

Location

1.10 The site is situated on Maresfield Gardens in Camden, North London as shown in Figure 1.

Figure 1- Site Location

Existing Development

1.11 The total impermeable area on site is 106m² which constitutes approximately 25% of the total site area 424m². The existing dwelling is a large family house with extensive garden.

Proposed Development

1.12 Proposals are for revisions to the external design with the construction of a new house comprising lower ground, upper ground and first floor level light wells to front and rear.

1.13 It has been proposed that the existing combined drainage will remain however a 50% reduction to the existing peak surface water discharge rate will be implemented.

[1] Planning Policy Statement 25, March 2010

[2] London Borough of Camden, Shaping Camden – Guidance – New Basement Development and Extensions to Existing Basement Accommodation, February 2009

[3] London Borough of Camden – Camden Planning Guidance (CPG4) Basements and Lightwells

[4] ARUP Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development, November 2010

2.0 Potential Flooding on Site

Historic Information

2.1 No records have been found of the site flooding in the past from any of the sources identified in PPS25.

2.2 It is noted in the North London SFRA[5] that a large area in the north of Camden was affected by surface water flooding in August 2002, which was the result of heavy rainfall inundating the public sewer system. A similar region of Camden was affected by surface water/sewer flooding in 1975. In both instances the flooding that occurred is understood to have been the result of high intensity rainfall inundating the main sewer and causing manholes and gullies to surcharge.

2.3 However, even during these high intensity events that have, on 2 occasions, affected large parts of Camden, there is no record of the site or Maresfield Gardens being affected by surface water flooding.

2.4 Map 22 of the SFRA[5], and Figure 15 of the ARUP study[1] show the roads which were recorded as flooded in 1975 and 2002. Maresfield Gardens is not highlighted on these maps.

Tidal and Fluvial Flooding

2.5 In October 2004, the Environment Agency released updated floodplain maps for the UK based on the 'JFLOW' project, a two-dimensional hydraulic modelling project.

2.6 The site is located in Flood Zone 1, approximately 5km north of the Thames at its nearest location. By the definition of Flood Zone 1, the risk of the site being affected by fluvial or tidal flooding is therefore less than 0.1% in any given year.

2.7 Although no area of the London Borough of Camden is in Flood Zone 2 or Flood Zone 3, there are several watercourses in the borough, the majority of which have been culverted and are often referred to as 'Lost Rivers'.

Flooding from Sewers

2.8 Surface water flooding is typically the result of high intensity rainfall that is unable to infiltrate into the ground or enter the drainage system, ultimately following overland flow paths. In an urban environment such as Camden, surface water runoff is disposed of almost entirely via formal drainage systems, and consequently sewer flooding and surface water flooding (overland flow) need to be considered in tandem in this instance.

2.9 It is reasonable to assume that adopted sewers have been designed to the 1 in 30 year return period (in accordance with Sewers for Adoption 6th Edition[6]), which is considerably lower than the 100 year standard considered for fluvial flooding. As such, sewer flooding is often more frequent but less severe than fluvial flooding.

2.10 Data collected from the 1975 and 2002 events were used to map areas of the borough that are more susceptible to surface water flooding. This information was subsequently used to inform Camden's supplementary guidance document on basement developments[2]. In this document, roads that were affected by either flood are known as "secondary areas", and roads affected by both floods are known as "primary areas". Any proposals for a basement development located in a primary or secondary area must include a flood risk assessment.

2.11 The site is not located in either a primary or a secondary area. The risk of sewer and surface water flooding is therefore considered to be low in this region of London Borough of Camden.

Flooding from Artificial and Lake Water Bodies

2.12 The Regent's Canal and Regent's Park Lake are the nearest artificial water bodies to the site (reference Figure 12 of the ARUP Study)[1]. However at both locations water is not retained above natural ground level and flooding as a result of infrastructure failure is therefore not possible.

2.13 Figure 14 of the ARUP study shows the Hampstead Heath Surface Water Catchments and Drainage, including the pond chains, in greater detail. The site is not located within the catchment of the pond chains on Hampstead Heath.

2.14 The risk of flooding from artificial water bodies is therefore considered extremely unlikely.

Flooding from Groundwater

2.15 Figure 4 of the ARUP study[1] shows that the sites underlying geology is London Clay however a more detailed site investigation[7] has revealed that the site is actually underlain by the Claygate Member which is classified by the Environment Agency as a secondary aquifer.

2.16 The SFRA also noted that there have been very few recorded incidents of groundwater flooding in North London, none of which were located in Camden.

2.17 Groundwater was generally encountered as seepages within the Claygate Member at depths of between 2.0 m BGL (80.0 m OD) and 6.0 m BGL (79.3 m OD), whilst a slow inflow was recorded in Borehole No 1 at a depth of 4.5 m BGL (77.2 m OD), rising to 4.3 m BGL (77.4 m OD) after a period of 20 minutes. A deeper water strike, comprising a seepage from within the London Clay, was also recorded in one of the boreholes at a depth of 18.5 m BGL (66.0 m OD), rising to 18.3 m BGL (66.2 m OD) after a period of 20 minutes. Subsequent monitoring has shown groundwater to be present at depths of 1.96 m BGL (79.74 m OD), 3.56 m BGL (80.94 m OD) and 4.40 m BGL (80.90 m OD) in Borehole No's 1, 2 and 3 respectively, indicating an approximate groundwater flow direction towards the west-southwest.

2.18 It was recommended that further monitoring is carried out to establish equilibrium levels of groundwater.

2.19 On the basis of groundwater observations to date, groundwater will be encountered within the depth of the proposed basement excavation. However these low volume pockets of water do not pose a significant risk in terms of flooding.

2.20 The risk of the site being affected by groundwater flooding is therefore considered to be low.

[5] North London Strategic Flood Risk Assessment, (August 2008)

[6] WRc7 pic. (March 2006) Sewers for Adoption – A Design and Construction Guide for Developers. 6th Edition.

[7] Ian Farmer Associates, Phase 2 Site Investigation, Contract No. S1148A, July 2006

3.0 Surface Flood and Flooding Impact Assessment

Stage 1: Screening

3.1 CPG4 includes a Surface flow and flooding screening flowchart for assessing the impact of potential sources of flooding, as well as the impact of the development on flood risk elsewhere.

3.2 The flow chart is set out with six questions, which are addressed with reference to the site and proposed development at 59 Maresfield Gardens as follows:

Question 1: Is the site within the catchment of the pond chains on Hampstead Heath?

Reference: Figure 14 of the ARUP Study

Answer: No

Question 2: As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak runoff) be materially changed from the existing route?

Reference: Surface water runoff mechanisms and connection type and location with receiving watercourse

Answer: Yes

Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced/paved external areas?

Reference: Total area of roof and external paved area following development compared with the existing site.

Answer: Yes

Question 4: Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourse.

Reference: Proposed landscaping and drainage system to be implemented as part of the development compared with the existing site. SUDS are required to mitigate any increase in peak flow.

Answer: Yes

Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses:

Reference: Proposed landscaping and drainage system to be implemented as part of the development compared with the existing site. SUDS are required to mitigate any increase in peak flow.

Answer: No

According to CPG4, it is necessary to carry forward to the scoping stage of the Basement Impact Assessment those matters of concern where the response is 'yes'. Therefore, it is necessary to consider Question 2, 3 and 4 in more detail.

In addition:

Question 6: Is the site in an area known to be at risk from surface water flooding, such as South Hampstead,West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?

Reference: Consider the risk of flooding from surface water and artificial water bodies

Answer: No – see chapter 2 for details. A Flood Risk Assessment is therefore not required.

Stage 2: Scoping

3.3 The proposed development will increase the impermeable area on site therefore the volume and peak flow rate of surface water generated from the will also increase. At present the site has approximately 106m² of hard surface discharging to the sewer. After the new house is constructed this will increase to approximately 130m². It is assumed that the rear garden and the front garden will retain soft or porous surfaces allowing rainwater to infiltrate naturally and that the ramps to the front and rear will drain away locally.[8]

Stage 3: Site investigation and Study

3.4 Chapter 2 of this report contains information on the background of the project, the various organisations and studies which have been consulted for data, as well as the site investigations which have been undertaken. Surface water runoff is the only issue which requires further consideration past the screening stage. The scoping stage of the assessment identified the need for mitigation to minimise the impact of the development on surface water flows.

Stage 4: Impact Assessment

3.5 The Impact Assessment describes the specific impacts of the project on the environment by comparing the existing situation with the situation when the basement is in place. This will be achieved using a systematic approach to describe, quantify and accumulate the effects of the development on those attributes or features of the geological, hydrogeological and hydrological environment which have been identified from the Scoping stage as being potentially affected.

3.6 The existing site area is 424m² of which 106m² (25%) is of hard standing surfaces that discharges to the sewers. After the new house is constructed this will increase to approximately 130m² (31%).

3.7 The existing surface water runoff rate from the site is 1.6l/s and this would increase to 2.06l/s without attenuation measures. It is proposed to reduce the rainwater runoff to 0.8l/s. The preferred SUDS method to be used for this specific development at 59 Maresfield Gardens will be the introduction of an attenuation tank to reduce the peak surface water runoff by 50% of previous rates.

3.8 The final design has yet to be completed, and it is recommended that additional SUDS such as rainwater harvesting should be considered in the detailed design. In reality it is not practical to restrict runoff rates to very low values such as 0.8l/s and therefore the lowest practical rate will be used.

3.9 A topographic survey of the site reveals that ground levels are much higher on Maresfield Gardens than the ground levels around the house. In order to prevent surface water entering the site from Maresfield Gardens it is recommended that the driveway entrance level should be maintained at footpath level therefore if surface water was to reach this section of road it would be contained within the carriageway.

[8] Peter Dear Associates, Planning, Access and Design Report, August 2008

4.0 Conclusions and Recommendations

4.1 The site is located at the northern end of Maresfield Gardens on the western side of the road near the junction of Netherhall Gardens. The property is located at the northern end of a terrace of three houses. The site ground levels fall from east to west with the rear garden a storey lower than the front entrance drive.

4.2 The site is shown in Flood Zone 1 of the latest Environment Agency Flood Zone maps, and by definition the risk of flooding from fluvial and tidal sources is less than 0.1% in any year. The site is less than 1ha, and therefore a full flood risk assessment is not required by Planning Policy Statement 25.

4.3 Data collected from flooding events in 1975 and 2002 has been used by Camden to map areas of the borough that are more susceptible to surface water flooding. This information was subsequently used to inform Camden's supplementary guidance document on basement developments. In this document, roads that were affected by either flood event are known as "secondary areas", and roads affected by both floods are known as "primary areas".

4.4 The site is not located in either a "primary" or "secondary" area therefore a flood risk assessment does not need to be carried out.

4.5 All sources of flooding have been assessed and are considered to pose a negligible risk to the site. While large areas in the north of the borough were affected by surface water and sewer flooding in 1975 and 2002, there are no known records that the site itself was affected in either event. It is recommended that more consideration is given to the ground levels of the driveway entrance and building entrance at the detailed design stage.

4.6 It can be concluded that the proposed basement is at a low risk of flooding from all sources, and that the proposed basement is considered acceptable in the context of flood risk.

Appendix

Drawing 1- Topographic Survey

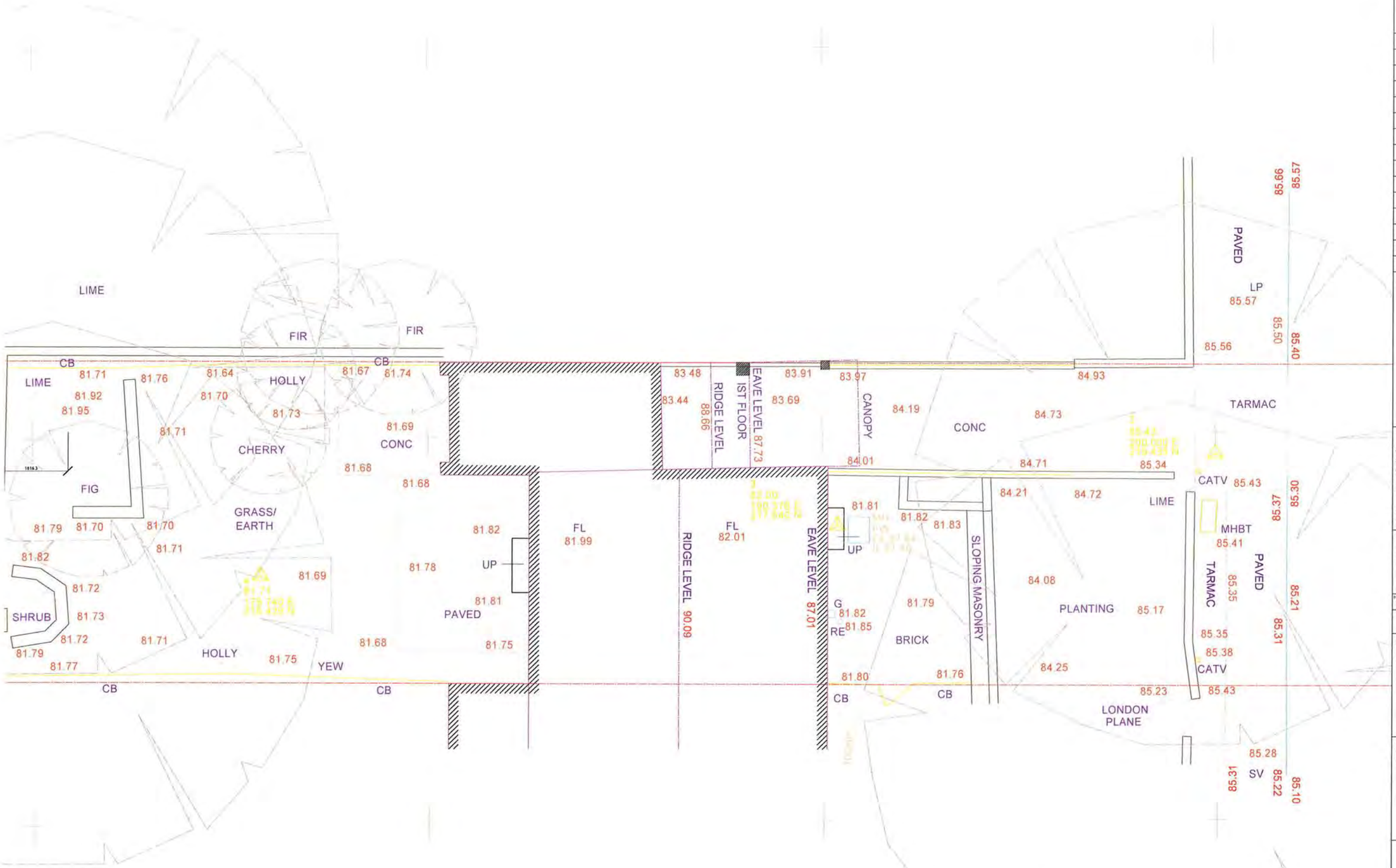
51% Studios, Drawing Number 1067/102, July 2008
The drawing shows levels on the site, including carriageway level in Maresfield Gardens, ground levels to the front, side and rear of the building, and finished floor levels of the existing dwelling.

Drawing 2- Proposed Entrance Level

51% Studios, Drawing Number 1095/203, July 2008
The drawing shows the proposed entrance level layout for 59 Maresfield Gardens.

Drawing 3- Proposed Basement Layout

51% Studios, Drawing Number 1095/200, July 2008
The drawing shows the proposed layout at basement level for 59 Maresfield Gardens.



Approved by client. Date:

authorized signature and company stamp

REV.	DATE	DESCRIPTION
A	12/08/2008	Issued for Planning

Issued for:

- ☐ PRELIMINARY
- ☐ RECORD
- ☐ INFORMATION
- ☐ COMMENTS
- ☐ APPROVAL
- ☐ SIGN AND RETURN
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do not scale drawing
all dimensions to be verified on site discrepencies in dimensions or drawing to be reported to architect
1. All work to comply with local and national building codes.

2. This drawing to be read in conjunction with all relevant schedule of works sections related to works described here.

Drawing Name

Survey

project no. 1095 | type | no. | qty

scale: 1:100 @ A3

Project Title

59 Maresfield Gardens

Developer / Client

Stefanie Drews & Colin Rowat

51% Studios Ltd.
Studio 6, Dean House,
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project no. 1067/102

project name
59 Maresfied Gardens

date:	designed by:
15/07/2008	51%
checked by:	**approved by:**

0 1 2m 5m

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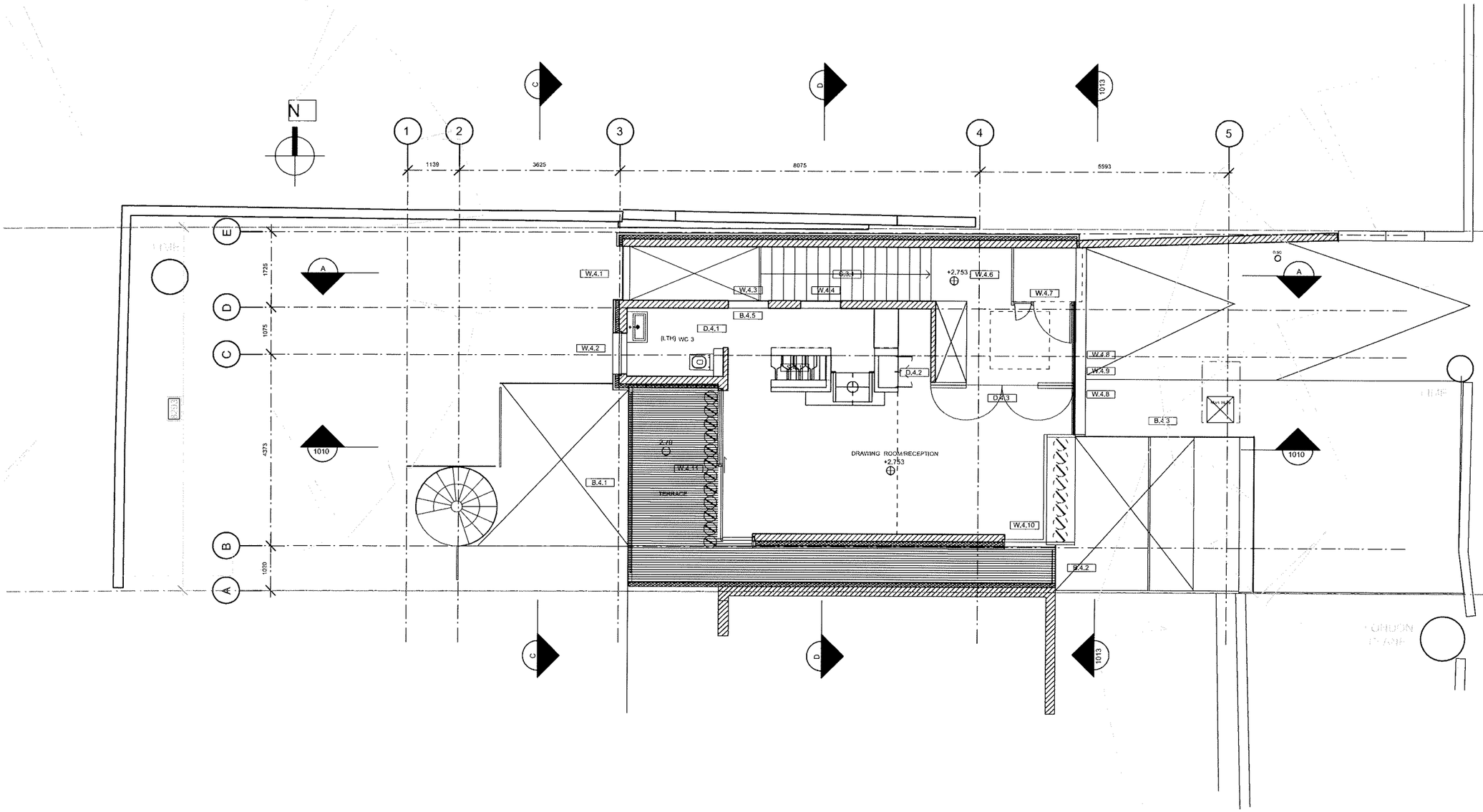

1 Entrance Plan
1:100

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NOTES

No.	Date	Issue Notes
H	19/12/08	Issued to Dewmac
G	18/12/08	Issued to DewMac for comment
F	16/12/2008	GA issued for services set out
E	28/11/2008	GA Issued to Building Control for Comment [without services]
D	20/11/2008	Issued to Building Control for comment
C	11/5/08	GA issued for services set out
B	10/30/08	GA Issued for comment
A	14/10/2008	Issued for comment

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Status
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Drawing
Entrance Plan

Project Architect: 51%	Project ID: 1095
Drawn By: HM	Scale: 1:100 @ A3
Checked By: 51%	Drawing No.: 1003
Date: 14/10/2008	Issue: H
File Name: 1095_59 Maresfield Gardens	

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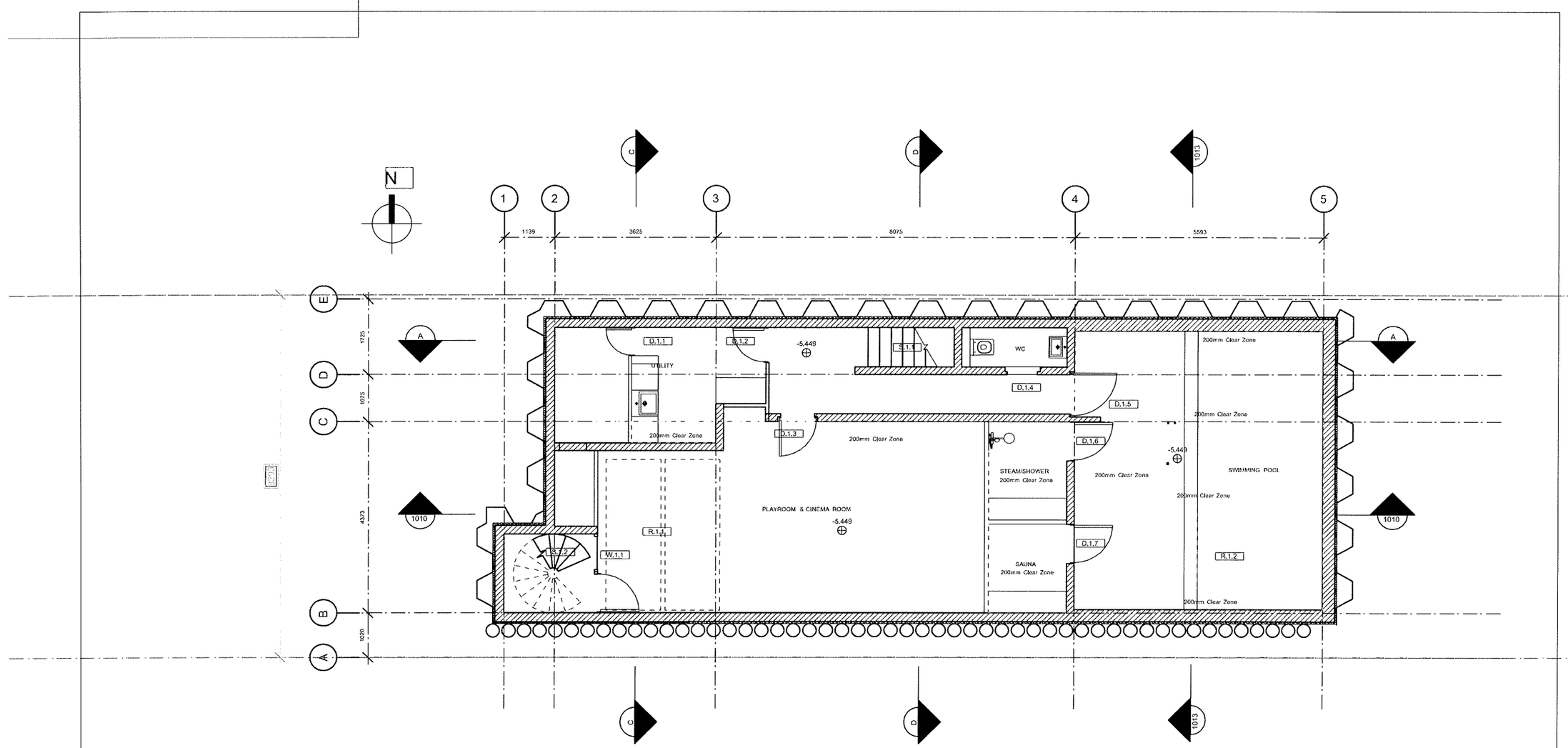

1 Basement Plan
1.100

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B	30/10/2008	GA Issued for Comment
A	14/10/2008	Issued for Comment

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Project
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Status
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Drawing
Basement Plan

Project Architect: 51%	Project ID: 1095
Drawn By: HM	Scale: 1:100 @ A3
Checked By: 51%	Drawing No.: 1000
Date: 14/10/2008	Issue: H
File Name: 1095_59 Maresfield Gardens	

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APPENDIX 3

Chord Environmental Groundwater Impact Report

59 Maresfield Gardens

Groundwater Impact Assessment

59 Maresfield Gardens
London
NW3 5TE

Site NGR: TQ 264 851

Prepared for:

Stefanie Drews & Colin Rowat

Chord Environmental Ltd

Report no. 1102/R1

November 2012

47 Clifford Street, Chudleigh, Newton Abbot, , Devon. TQ13 0LE
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59 Maresfield Gardens Groundwater Impact Assessment

Site Address

59 Maresfield Gardens

London

NW3 5TE

Site NGR: TQ 264 851

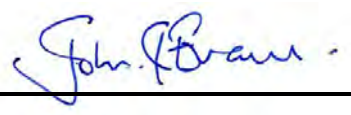
Document Control Sheet

This report has been prepared with all reasonable skill, care and diligence within the terms of the contract with Stefanie Drews & Colin Rowat incorporating Terms of Agreed work and taking account of the manpower and resources devoted to it by agreement with the client.

Chord Environmental Ltd. disclaims any responsibility to the client and others in respect of any matter outside the scope of the above.

The report is confidential to Stefanie Drews & Colin Rowat. Chord Environmental Ltd. accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known.

Chord Environmental Ltd

Prepared by:	John Evans MSc FGS CGeol	

Report no:	1102/R1	**Issue no:**	4	**Date:**	7th April 2014

Chord Environmental Ltd.

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1 Introduction

1.1 Background

Stefanie Drews and Colin Rowat are applying for Planning Consent to demolish the existing end terrace, split level two-storey house at 59 Maresfield Gardens and construct a new detached two-storey building with a double level basement and additional swimming pool level. Formation level for the proposed basement is understood to be at an approximate level of 76.5 m OD, c.6.5m below existing site levels adjacent to the house.

Site investigation works have been undertaken by Ian Farmer Associates (IFA) in 2008[1] and Geotechnical and Environmental Associates (GEA) Ltd in 2011[2]. The work comprised detailed Ground Investigations and this assessment should be read in conjunction with both the IFA and GEA site investigation reports.

Chord Environmental has been commissioned by Elliott Wood Partnership on behalf of Stefanie Drews & Colin Rowat, to carry out a groundwater assessment for the proposed development at 59 Maresfield Gardens, London, NW3 5TE, to meet the requirements of London Borough of Camden's "Guidance for Subterranean Development"[3].

1.2 Scope and Approach

This report reviews the proposed development at 59 Maresfield Gardens within the context of the conceptual understanding of its site setting which has been informed through both desk study and review of site investigation findings. The report will identify potential groundwater impacts the development may have. Appropriate mitigating measures can then be developed and adopted to avoid or minimise these affects where identified.

This report is limited to the groundwater flow component of the Basement Impact Assessment, as specified by the London Borough of Camden's "Guidance for Subterranean Development". The Author of this report is a qualified Hydrogeologist, Chartered Geologist and Fellow of the Geological Society of London, as required by the Guidance.

[1] Report on Phase 2 Site Investigation – 59 Maresfield Gardens, London NW3 5TE. Ian Farmer Associates. July 2008.

[2] Site Investigation and Impact Assessment Report – 59 Maresfield Gardens, London NW3. Geotechnical and Environmental Associates Ltd. May 2012.

[3] Camden Geological, Hydrogeological and Hydrological study - Guidance for Subterranean Development. Ove Arup & Partners Ltd., November 2010

1.3 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the site information obtained from the client or other third parties and the results of the work should be viewed in the context of the range of data sources consulted. No liability can be accepted for information in other data sources or conditions not revealed by the information provided. There may be conditions prevailing at the Site which have not been disclosed by the site investigations undertaken. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by Chord Environmental Ltd.

2 Proposed Development

The Site occupied by 59 Maresfield Gardens, South Hampstead, London (National Grid Reference TQ 264 851) is a residential property approximately rectangular in shape and 30m by 8m in area. The existing split level, two-storey, end terraced house is located on the middle part of the site. The property fronts on to Maresfield Gardens to the east and is bounded by the adjoining terrace of No.57 Maresfield Gardens to the south. There is a driveway, garden and courtyard to the front of the property and small garden to the rear. The elevation of the site drops sharply by 3.5m from c.85.5m above Ordnance Datum (OD) at the front of the property to c.81.75m OD within the front courtyard and rear garden areas.

The proposal is to demolish the existing house at 59 Maresfield Gardens and construct a new detached two-storey house with double level basement and additional swimming pool level. The basement formation level will extend to a depth of up to 8m below existing lower site levels and be approximately double the existing building footprint in area. A secant pile wall foundation would be constructed around the proposed basement with female piles extending to 72.5m OD (c.9.5m below ground level) and male piles extending to 67m OD (c.15m bgl). Areas of hard standing will increase by approximately 35% from 106m^2 to 130m^2.

3 Site Setting

The Site is located on the northern end of Maresfield Gardens in the South Hampstead area of London, NW3 5TE and National Grid Reference TQ 2642 8517.

3.1 Topography

The majority of the Site lies at an elevation of approximately c.82m OD rising sharply to c.85.5m OD to the east of the site fronting on to Maresfield Gardens. Locally the topography falls away to the southwest across the site to c.40m OD at the River Thames, c.2km to the south and rising to an elevation of 134m OD on Hampstead Heath, c.1.5km north of the site. Within the Site itself the ground from the rear garden through to the front courtyard is relatively level and is c.3.5m below the level of Maresfield Gardens and the eastern part of the site comprising a garden area and driveway.

3.2 Hydrology and Drainage

The Site lies within the surface water catchment of the upper Westbourne stream, a tributary of the River Thames, and outside of the catchment of the Hampstead Heath chain of ponds. The Westbourne is entirely covered and culverted and forms part of the surface water sewerage system, running beneath South Hampstead to where it discharges into the Thames to the west of Chelsea Bridge. According to historic maps[4],[5] (1870-71) a small headwater tributary of the Westbourne flowed across the north-western corner of the Site which rose from a pond 20m north of the Site. The area was undeveloped at this time. By 1896 the area is shown to be developed with the current road infrastructure in place and the pond and headwater tributary entirely removed.

There are no surface water features marked on current Ordnance Survey mapping (1:25,000 scale) within 1km of the Site. The site is not located within a Flood Zone as defined by the Environment Agency and Maresfield Gardens has not been identified as a street at risk of surface water flooding as a result of sewer surcharging within the London Borough of Camden.

3.3 Geology

According to the British Geological Survey (BGS) 1:50,000 scale sheet for the area (Sheet 256, North London. 2006) and the associated geological memoir, The Geology of London (BGS 2004), the Site is underlain by the clays, silts and fine grained sands of the Eocene Claygate Member, the upper unit of the London Clay Formation. The Eocene silty clay of the London Clay outcrops c.30m down gradient to the west of the Site and the sands of the

[4] The Lost Rivers of London: a study of their effects upon London and Londoners, and the effects of London and Londoners upon them. N. Barton. 1962.

[5] Report on Phase 1 Desk Study – 59 Maresfield Gardens, London NW3 5TE. Ian Farmer Associates. June 2008.

Bagshot Formation outcrop up topographic gradient, 300m north beneath Hampstead village.

The Site lies 30m to the east of an area denoted by the BGS as likely to be covered by Quaternary Head deposits. This is disturbed material which has been mobilised from higher ground.

The London Clay is underlain by the Cretaceous Chalk at a depth of over 100m beneath the Site.

Site specific geological data from the IFA and GEA site investigations[1, 2], have established the presence of between 0.2m and 3.0m thickness of made ground beneath the Site locally. Claygate Member silty, sandy clay was proved to depths of 8.3m (73.4m OD) and 12.0m (72.5m OD) and stiff dark grey silty London Clay was then proved to a depth of 20m below ground level (61.7m OD). A thin layer of sand (0.15m) was present within one borehole in the east of the site however this was not established in any of the other boreholes.

Alluvium comprising silty clayey sand over sandy clay was established beneath made ground in the western part of the site. This corresponds with the location of the headwater stream on the 1871 historic map.

A geological cross section of the site showing the existing building and proposed basement in relation to the ground conditions encountered has been prepared by GEA[2] and is included as an appendix to this report.

3.4 Hydrogeology

The Environment Agency classifies the Claygate Member and overlying Bagshot Beds as Secondary A Aquifer, which have permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

Although the Claygate Member is classified a Secondary Aquifer, a majority of the springs in the area (arising on Highgate and Hampstead Heath) occur at the boundary between the sands of the Bagshot Formation and the lower permeability clay rich Claygate Member. The Claygate Member's Secondary Aquifer classification is due to the presence of beds of glauconitic silty fine sand; however as these have been proved to be absent beneath the site, the silty clays encountered can be considered as Non-Productive strata.

London Clay is classified as Non-Productive Strata (formerly Non Aquifer), i.e. not capable of providing useable quantities of water. The Cretaceous Chalk is classified as a Principal (formerly Major) Aquifer however it is highly confined and not generally used for drinking water supply in the central London area due to its poor water quality.

The Site lies approximately 600m north of a Source Protection Zone as designated by the Environment Agency. This is for a licensed public water supply abstraction from the Chalk.

Groundwater Levels

During the GEA site investigation, groundwater was generally encountered as seepages within the Claygate Member at depths of between 2.0 m (80.0 m OD) and 6.0 m (79.3 m OD), whilst a slow inflow was recorded in Borehole No 1 at a depth of 4.5 m (77.2 m OD), rising to 4.3 m (77.4 m OD) after a period of 20 minutes.

Monitoring undertaken within installed boreholes across the Site is summarised in the table below.

Location	BH1		BH2		BH3	
Water Level	**mbgl**	**m OD**	**mbgl**	**m OD**	**mbgl**	**m OD**
December 2011	1.96	79.74	3.56	80.94	4.40	80.90
October 2012	1.90	79.80	3.53	80.97	4.51	80.79

There is very little change in groundwater levels despite winter 2011 being a period of very limited rainfall leading to drought conditions be the spring of 2012 followed by over six months of exceptionally wet conditions. Recharge through the Claygate Member and London Clay Formation strata is expected to be limited to approximately 50mm per annum where clay strata dominates, severely limiting vertical flow and groundwater levels are anticipated to vary by less than 0.5m annually.

Groundwater Flow

Groundwater within the Claygate Member is considered to be dominated by intergranular flow through the thin horizons of fine silty sand (where present) and fissure flow through silty clay beds. Groundwater present within the Claygate Member will be confined by the very low vertical permeability clay beds which separate the more permeable silty and sandy clays.

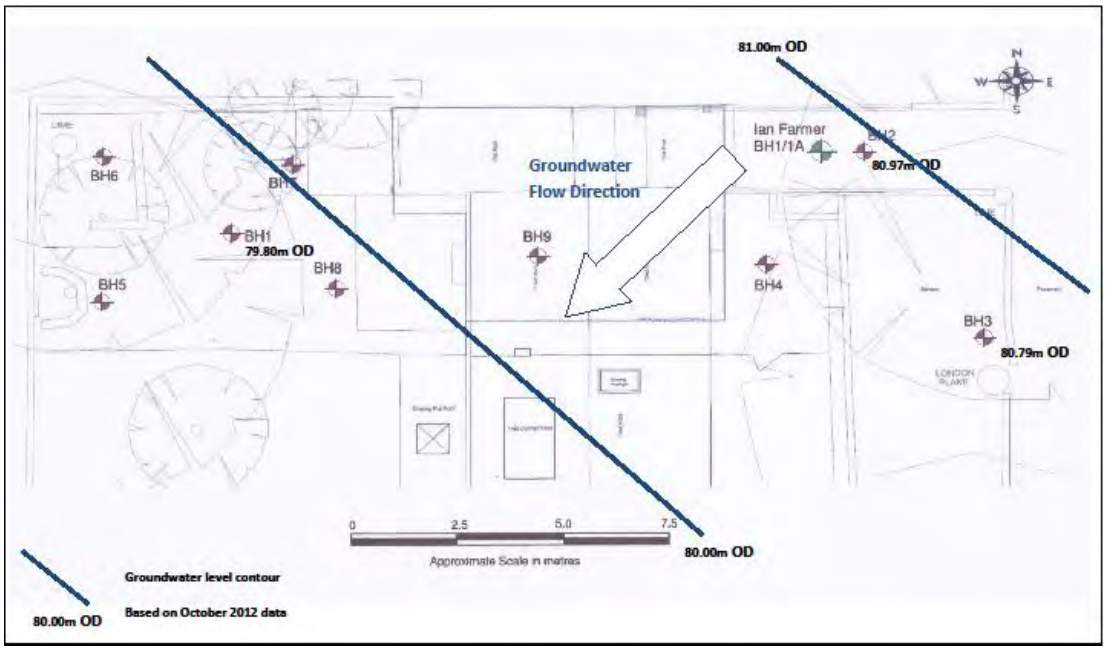
Rising head tests were undertaken by GEA during October 2012 to estimate the permeability of the Claygate Member strata beneath the site. The results and analysis of the rising head tests are appended to this report and summarised in the table below.

Borehole	Test Section (m bgl)	Permeability (ms^{-1})
BH1	1.90 – 7.84	2.07×10^{-8}
BH2	3.53 – 10.22	2.19×10^{-8}
BH3	4.51 – 8.65	6.66×10^{-8}

These results are consistent with published permeabilities for London Clay Formation strata and represent the highest permeability encountered throughout each borehole. It is highly unlikely that any excavation beneath the Site will encounter any saturated high permeability strata as none was encountered within the ten boreholes drilled across the site. Any such strata, if present, would not be laterally continuous and would have very limited water bearing potential.

IFA also undertook rising head tests within one borehole (BH1/BH1A) which yielded permeabilities of between 4.8 x 10^{-7} ms^{-1} and 2.9 x 10^{-7} ms^{-1}. However the test results presented show that the water level in BH1A stopped recovering after 15 minutes placing some doubt on the borehole's hydraulic continuity with the surrounding strata. The rising head tests for BH1 were not analysed within the IFA report however subsequent analysis indicates a permeability of c.8.0 x 10^{-9} ms^{-1} for strata between 6 and 12m below ground level.

A groundwater contour plan prepared using groundwater monitoring data collected during October 2012 is presented below.



Monitored groundwater levels and interpreted groundwater level contours indicate a groundwater flow direction to the southwest. This coincides with the local topographic gradient as would be expected. The hydraulic gradient across the Site is approximately 0.1, which is relatively steep and is typical of very low permeability clay dominated strata.

The Westbourne stream and its associated headwater tributary, which historically crossed the northwest part of the site, are considered to rise from springs and seepages from the Bagshot Formation sands on Hampstead Heath and to be perched on the Claygate Member and London Clay. Alluvium associated with this tributary was found to comprise 1m of desiccated silty clayey sand within BH6 indicating that the flow path has most likely been collected by surface water drainage up gradient of the Site.

4 Screening

The London Borough of Camden's "Guidance for subterranean development" states that any development proposal which includes a subterranean basement should be screened in order to determine whether there is a requirement for a BIA to be carried out.

4.1 Screening Assessment

Appendix E of the guidance document details six Basement Impact Assessment screening questions, each of which is stated and answered below:

- **Question 1a: Is the site located directly above an aquifer?**
- Yes. The Site is underlain by the Claygate Member which is designated as Secondary Aquifer by the Environment Agency and considered capable of supporting local water supplies and baseflow to watercourses. However, site investigation information shows the Claygate Member to comprise silty sandy clays and to have a very low permeability exhibiting the hydraulic properties of Non Productive strata.
- **Question 1b: Will the proposed basement extend beneath the water table surface?**

  Based on the findings of the site investigation, the basement would extend beneath the water table surface (i.e. saturated Claygate Member). The proposed basement would extend to a depth of approximately 6.5m below existing ground level. An 8m deep secant pile wall foundation would be constructed. The monitoring standpipes installed during the site investigation indicated groundwater within the Claygate Member to be 1.90m below ground level during October 2012 following a very wet summer and autumn. Groundwater levels are not expected to vary by more than 0.5m throughout the year. Refer to Section 3.4.
- **Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?**

  No. According to historic maps[4,5], a headwater tributary of the Westbourne flowed across the northwest of the Site, rising from a pond c.20m north of the site. This stream is not present at surface and is considered to have been culverted to form part of the local surface water sewer up stream of the Site. Site investigation findings established the presence of dry alluvium in the west of the Site however no shallow flow was encountered in this area. The low permeability of the Claygate Member and London Clay strata does not support groundwater flows to the headwater tributary and are effectively hydraulically isolated from it. The Site is not within a street which has been identified as being at risk of surface water flooding as a result of sewer surcharging within the London Borough of Camden. Refer to Section 3.2 and 3.4.

- **Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?**

  No. The Site is outside the catchment of Hampstead Heath ponds. Refer to Section 3.2.

- **Question 4: Will the proposed development result in a change in the proportion of hard surfaced / paved area?**

  Yes. Areas of hard standing will increase by 35% from 106m^2 to 130m^2.

- **Question 5: As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to ground (e.g. via soakaways and/or SUDS)?**

  No. The low permeability nature of the Claygate Member strata is unsuitable for receiving significant surface water discharge to ground.

- **Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?**

- No. There are no ponds or spring lines present within 100m of the Site.

4.2 Screening Conclusions

The screening exercise has identified the following potential issue which should be assessed:

1. The Site is underlain by the Claygate Member, classified a Secondary Aquifer by the Environment Agency, capable of supporting local water supplies and baseflow to watercourses.
2. The basement structure would extend into saturated Claygate Member and London Clay Formation strata.
3. The proposal will increase the hardstanding area by 35% from 106m^2 to 130m^2.

5 Scoping and Site Investigation

Scoping is the activity of defining in further detail the matters to be investigated as part of the impact assessment. Potential impacts should be ascertained for each of the matters of concern identified during the screening process.

The investigation of the potential impacts is undertaken through a site investigation. In this instance, a desk study and site investigation has been undertaken to establish ground conditions for geotechnical assessment purposes. The investigation included the installation of three groundwater monitoring installations to depths between 8m and 12m below ground level. This assessment relies upon the findings of the desk study and site investigation.

5.1 Potential Impacts

The following potential impacts have been identified:

Potential Impact	**Relevant Site Investigation conclusions**
The basement structure would extend into saturated ground. The groundwater flow regime may be altered by the proposed basement. Change in flow regime could potentially cause the groundwater level within the zone encompassed by the new flow route to increase (causing up hydraulic gradient mounding) or decrease down gradient locally. For existing nearby structures the degree of dampness or seepage may potentially increase as a result of changes in groundwater level.	The ground investigation has confirmed the presence of Claygate Member and London Clay beneath the Site. It has also identified confined groundwater levels within the Claygate Member and London Clay formation, and the basement would extend beneath this piezometric groundwater level. The Claygate Member is classified as a Secondary Aquifer however site investigation findings have has established it to be predominantly comprised of very low permeability silty sandy clay exhibiting the hydraulic properties of Non Productive strata.
The Site is underlain by a Secondary Aquifer. The proposed development may reduce baseflow to watercourses or reduce the supply of local water supplies.	The Claygate Member is considered to be a Secondary Aquifer however site investigation findings have has established it to be predominantly comprised of silty sandy clay. Groundwater encountered during the site investigations entered boreholes very slowly reflecting low permeability (c.5 x 10^{-8} ms^{-1}). The silty sandy clays encountered cannot store or transmit significant quantities of groundwater and exhibit hydraulic properties of Non Productive strata which cannot support baseflow to springs or streams.

The proposal will increase areas of hard standing by 35% from 106m^2 to 130m^2. The sealing of the ground surface to rainfall will result in decreased recharge to the underlying ground. In areas underlain by an aquifer, this may impact upon groundwater flow or levels. In areas of non-aquifer or Unproductive Strata (i.e. the London Clay), this may mean changes in the degree of wetness which in turn may affect stability.	The ground investigation has confirmed the presence of Claygate Member and London Clay beneath the Site, designated a Secondary Aquifer and Non Productive Strata or a "non-aquifer" respectively. The lithological logs and site investigation findings indicate that soakaway drainage is not appropriate for the Site due to the very low permeability clayey nature of the soils beneath the site.

6 Groundwater Impact Assessment

The screening process identified three potential impacts. The results of the desk study and site investigation have been used below to address these concerns and assess the likelihood of a negative impact occurring. These are:

1. Altering of the groundwater flow regime as a result of the proposed basement development.

Long Term Built Impact

The proposed basement formation level will extend to a depth of up to 8m below existing lower site levels. A secant pile wall foundation would be constructed around the proposed basement with female piles extending to 72.5m OD (c.9.5m below ground level) and male piles extending to 67m OD (c.15m bgl).

It has been established that the basement would extend beneath the piezometric surface (or confined groundwater level) within the Claygate Member and London Clay Formation strata. Once constructed, the proposed basement and its secant pile wall foundation would not allow the flow of groundwater beneath the site to the depth of the female piles. The potential impact of this is that the groundwater could potentially mound against the basement structure as groundwater is prevented from flowing along its natural path.

Based on the groundwater levels available, groundwater flows from northeast to southwest across the site. The proposed basement would present a c.10m wide blockage to groundwater flow in this direction. When considering the width of the proposed basement, it is considered very unlikely that the structure would cause a significant damming of groundwater to occur.

The site investigation has established that the geological formation into which the basement would be constructed comprises very low permeability silty sandy clay. The hydrogeological properties of the Claygate Member and London Clay present beneath the Site are such that free flowing groundwater is not present in significant quantities and is flowing at very low rates. Groundwater flow in such material is severely restricted by the absence of interconnected granular pore spaces which are occupied by a very fine clay particle matrix. The clay matrix adsorbs water and does not allow effective groundwater flow (i.e. the clay strata can hold groundwater but not transmit it through groundwater flow).

On this basis, it is highly unlikely that there would be any adverse affects from a local change in groundwater level resulting from the proposed basement development.

There are no adjacent neighbouring basement structures which could be affected any small local changes in groundwater level associated with the proposed basement structure. A swimming pool is located on higher ground within 40 Netherhall Gardens beyond the Site's northern boundary. The pool is approximately 2.0 m from the site boundary and has a basal elevation of c.81.5m OD, similar to the existing ground level of the Site. The very low permeability and hydraulic properties of the clay dominated strata beneath the Site make it highly unlikely that any significant changes to groundwater level or flow beneath the Site

as a result of the proposed basement development would occur either up gradient at 40 Netherhall Gardens or down gradient at 57 Maresfield Gardens.

Short Term Construction Impact

During construction, groundwater has the potential to enter the excavation. As measured permeability is of the order of 5×10^{-8} ms^{-1}, inflow rates are expected to be slow but prolonged whilst the excavation remains open. Given the depth and breadth of the site investigation, it is considered unlikely that significant higher permeable layers will be encountered, however it is possible that saturated pockets or inter-connected layers of groundwater could be encountered resulting in higher inflow rates.

On this basis, we agree with the GEA report that if the adopted method of temporary support during excavations is not watertight, it would be prudent for the chosen contractor to have a contingency plan in place to deal with more significant inflows as a precautionary measure. We also agree with GEA's recommendation that it would also be prudent to carry out a number of trial excavations, to depths as close to the full basement depth as possible, to provide an indication of the likely groundwater inflow conditions.

Based on the findings of the site investigation and subsequent data analysis, it is considered highly unlikely that the proposed development would result in significant changes to the groundwater flow regime surrounding the Site.

2. Reducing flow to watercourses and groundwater supplies developing within an Aquifer.

Although the Claygate Member is classified a Secondary Aquifer due to the presence of water bearing sand horizons, the site investigations have established that the Claygate Member beneath the site of the proposed basement is comprised of silty sandy clay and no significant water bearing sandy beds were encountered. It is apparent from the site investigation findings that groundwater is not present in significant quantities within the geological formations into which the basement would be constructed due to their lowly permeable hydrogeological properties. No groundwater abstractions have been identified within 500m and the Westbourne stream and the headwater stream identified on the historic map are fed by discharge from the Bagshot Beds outcrop 300m to the north of the site and are no flow near to the Site.

It is therefore considered highly unlikely that the proposed development will result in reduced groundwater flow to watercourses and abstractions.

Altering of the rate of groundwater recharge or changes in the degree of wetness through the creation of additional hard surfaces.

Due to the clayey nature of the soils, recharge to the lower Claygate Member and London Clay is likely to be negligible (of the order of c.50mm/a) due to the very low ($<1 \times 10^{-9}$ m/s) vertical permeability of the underlying clay dominated strata. In addition, the lowly permeable properties of these strata negate the possibility of significant discharging of surface water drainage to ground.

As the ground is unsuitable for a soakaway system, surface water drainage from the Site would by via existing surface water drains to the mains sewerage system.

Due to the nature of the soils beneath the site and the relatively small area of development, groundwater recharge (which is naturally highly restricted due to the low permeability of the Claygate Member and London Clay present beneath the site) would not be significantly affected by the proposed development.

7 Conclusions

A groundwater impact assessment of the proposed development has been undertaken. The assessment has been based on information and guidance published by the London Borough of Camden[3] and on site investigation information[1,2,3].

Detailed site investigation information has established the presence of low permeability clays beneath the Site. Rates of groundwater flow are therefore very low (estimated at c.3m/a) and the underlying strata are incapable of supporting flow to water features such as streams or spring lines down gradient of the Site.

Changes in groundwater level due to potential damming effect adjacent to the proposed basement development would not be significant because of the very lowly permeable Claygate Member and London Clay Formation strata present beneath the Site, which do not allow effective groundwater flow..

It is concluded that the proposed basement development is unlikely to result in significant changes to the groundwater regime beneath or adjacent to the Site. No potential adverse impacts have been identified as a result of the groundwater impact assessment.

Site	**59 Maresfield Gardens**	**Job Number**	1102
Client	**Stefanie Drews & Colin Rowat**	**Drawing Date**	09-11-12
Engineer	**Elliott Wood**		

Chord Environmental Ltd

47 Clifford St
Chudleigh
Newton Abbot
Devon TQ13 0LE

Groundwater Contour Plan

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
Herts AL4 0PG

Cross-Section

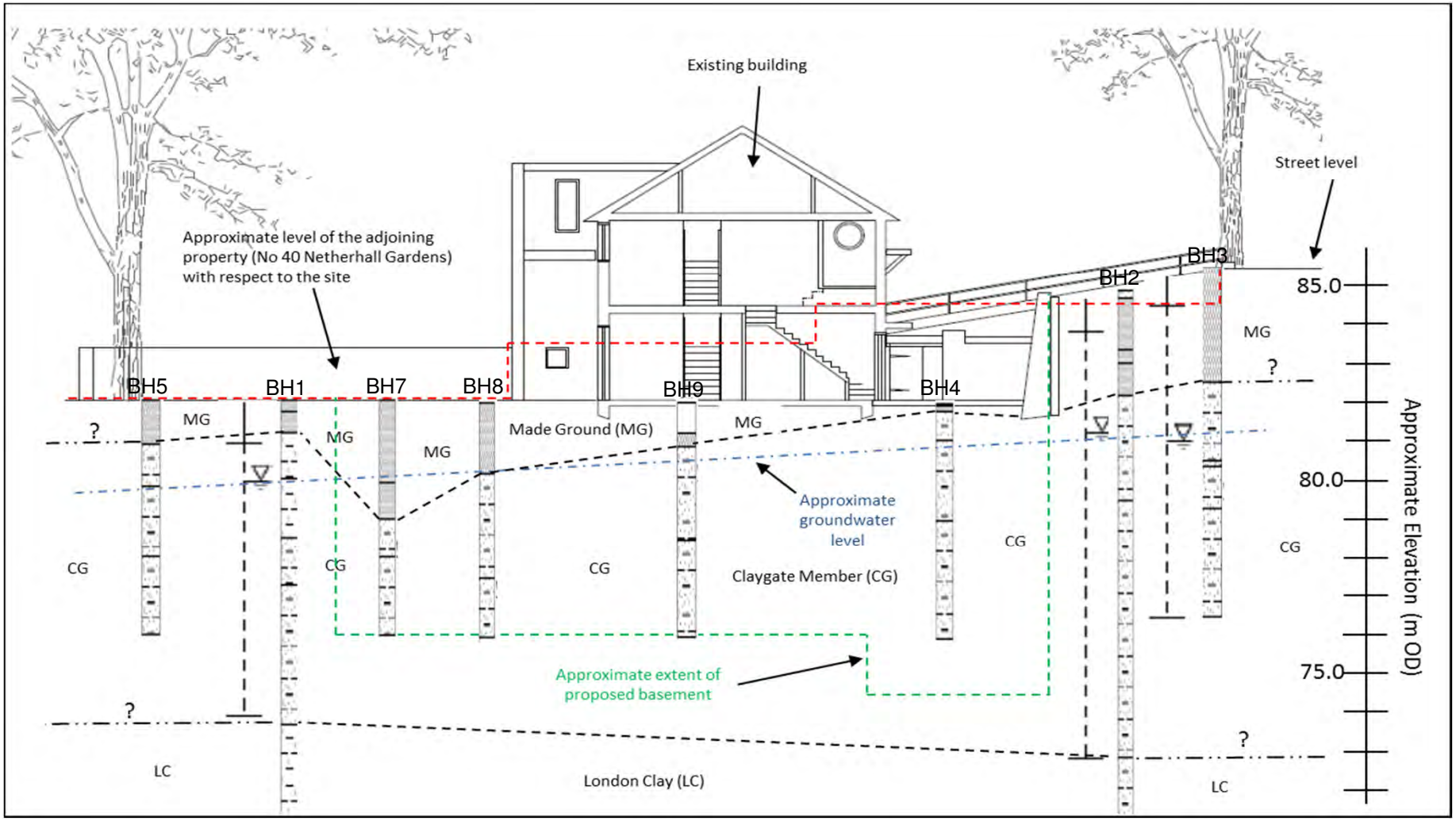
Site 59 Maresfield Gardens, London, NW3 5TE

Client Stefanie Drews & Colin Rowat

Engineer Elliott Wood

Job Number J11251

Sheet 1 / 1



Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
Herts AL4 0PG

Borehole Permeability Test

Site	59 Maresfield Gardens, London, NW3 5TE
Client	Stefanie Drews & Colin Rowat
Engineer	Elliott Wood

Job Number J11251

Sheet 1/3

Rising Head Permeabilty Test.

BOREHOLE No	BH1
TEST NO	1
DATE	22/10/2012

AT START OF TEST	
BH Depth	7.84
Casing Depth	
Water Level (m)	1.90

TIME	*WATER LEVEL (m)*
0 min	5.22
1 min	4.94
2 min	4.80
3 min	4.71
4 min	4.64
5 min	4.57
10 min	4.33
15 min	4.14
20 min	4.01
25 min	3.91
30 min	3.82
45 min	3.57
1 hr	3.35
1 hr 30 min	3.18
2 hr	3.13

Borehole Depth at End of Test (m)	7.82

REMARKS

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
Herts AL4 0PG

Borehole Permeability Test

Site	59 Maresfield Gardens, London, NW3 5TE
Client	Stefanie Drews & Colin Rowat
Engineer	Elliott Wood

Job Number J11251

Sheet 2/3

Rising Head Permeabilty Test.

BOREHOLE No	BH2
TEST NO	1
DATE	22/10/2012

AT START OF TEST	
BH Depth	10.22
Casing Depth	
Water Level (m)	3.53

TIME	*WATER LEVEL (m)*
0 min	3.87
1 min	3.87
2 min	3.87
3 min	3.86
4 min	3.86
5 min	3.86
10 min	3.85
15 min	3.84
20 min	3.83
25 min	3.82
30 min	3.81
45 min	3.79
1 hr	3.77

Borehole Depth at End of Test (m)	10.34

REMARKS

An obstruction or kink in the standpipe results in the 50 mm diameter bailer being obstructed and therefore a 19 mm diameter bailer must be used.

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
Herts AL4 0PG

Borehole Permeability Test

Site	59 Maresfield Gardens, London, NW3 5TE
Client	Stefanie Drews & Colin Rowat
Engineer	Elliott Wood

Job Number J11251

Sheet 3/3

Rising Head Permeabilty Test.

BOREHOLE No	BH3
TEST NO	1
DATE	22/10/2012

AT START OF TEST	
BH Depth	8.65
Casing Depth	
Water Level (m)	4.51

TIME	*WATER LEVEL (m)*
0 min	8.30
1 min	8.26
2 min	8.23
3 min	8.20
4 min	8.17
5 min	8.14
10 min	8.00
15 min	7.85
20 min	7.69
25 min	7.57
30 min	7.44
45 min	7.05
1 hr	6.68
1 hr 30 min	6.00
2 hr	5.41

Borehole Depth at End of Test (m)	8.70

REMARKS

Chord Environmental

Rising Head Data - Calculations using Horslev Test (1951)

Client: Geotechnical and Environmental Associates
Project: 59 Maresfield Gardens
Project No.: 1102
Borehole No. BH1

Abbreviations

L	Length of test section
D	Borehole diameter
d	Stand Pipe diameter
m	Permeability transformation ratio
h0 =	excess head at time t0 (m)
h =	excess head at time t (m)
t1 =	time at t1 (minutes)
h1 =	excess head at time t1 (m)
t2 =	time at t2 (minutes)
h2 =	excess head at time t2 (m)
K =	hydraulic conductivity (m/d)

All depths in metres below datum (borehole cover).

Calculations

FORMULA APPLIED = k = d**2*ln(2mL/D)*ln(h1/h2)/8*L(t2-t1)

NB Only applicable when mL/D>4 See Horslev 1951, pg 44 equation G.

Analysis

BH1	Section Tested	1.90 - 7.84	mBD
	Borehole Depth	7.84	mBD
	Length of test section (L)	5.94	m
	Borehole diameter (D)	0.1	m
	Standpipe diameter (d)	0.05	m
	Transformation ratio (m)	1	
	Depth to rest water level	1.90	mBD
	Water level at test start (mbd)	3.69	mBD

Selected Values

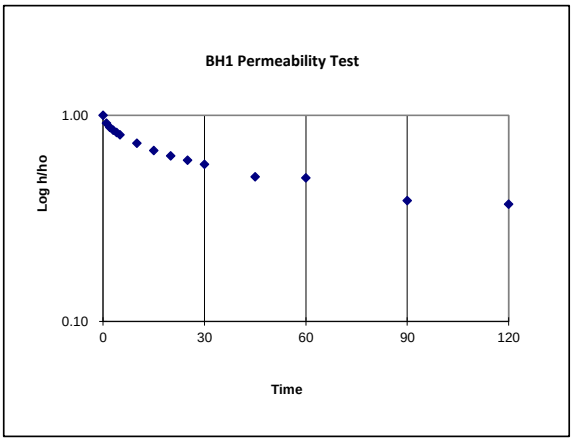
t1=	30.00	minutes
h1=	1.92	m
t2=	120.00	minutes
h2=	1.23	m

PERMEABILITY OF BOREHOLE SECTION: **0.001791 m/day** **2.07E-08 m/sec**

Prepared by: John Evans **Date** 30-Oct-12

Reference: Horslev 1951
Time Lag and Soil Permeability in Groundwater Observations
Bulletin No. 36, Waterways Experiment Station, Mississippi.

Time (seconds)	TIME (minutes)	h (metres)	h/h0
0	0.00	3.32	1.00
60	1.00	3.04	0.92
120	2.00	2.9	0.87
180	3.00	2.81	0.85
240	4.00	2.74	0.83
300	5.00	2.67	0.80
600	10.00	2.43	0.73
900	15.00	2.24	0.67
1200	20.00	2.11	0.64
1500	25.00	2.01	0.61
1800	30.00	1.92	0.58
2700	45.00	1.67	0.50
3600	60.00	1.65	0.50
5400	90.00	1.28	0.39
7200	120.00	1.23	0.37



Chord Environmental

Rising Head Data - Calculations using Horslev Test (1951)

Client: **Geotechnical and Environmental Associates**
Project: **59 Maresfield Gardens**
Project No.: **1102**
Borehole No. **BH2**

Abbreviations

L	Length of test section
D	Borehole diameter
d	Stand Pipe diameter
m	Permeability transformation ratio
h0 =	excess head at time t0 (m)
h =	excess head at time t (m)
t1 =	time at t1 (minutes)
h1 =	excess head at time t1 (m)
t2 =	time at t2 (minutes)
h2 =	excess head at time t2 (m)
K =	hydraulic conductivity (m/d)

All depths in metres below datum (borehole cover).

Calculations

FORMULA APPLIED = k = d**2*ln(2mL/D)*ln(h1/h2)/8*L(t2-t1)

NB Only applicable when mL/D>4 See Horslev 1951, pg 44 equation G.

Analysis

BH2	Section Tested	3.53 - 10.22	mBD
	Borehole Depth	10.22	mBD
	Length of test section (L)	6.69	m
	Borehole diameter (D)	0.1	m
	Standpipe diameter (d)	0.05	m
	Transformation ratio (m)	1	
	Depth to rest water level	3.53	mBD
	Water level at test start (mbd)	3.87	mBD

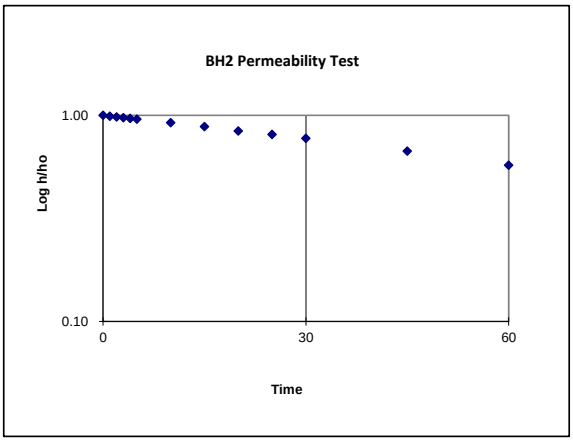
Selected Values

t1=	10.00	minutes
h1=	0.32	m
t2=	60.00	minutes
h2=	0.24	m

PERMEABILITY OF BOREHOLE SECTION: **0.001895 m/day**
2.19E-08 m/sec

Prepared by: **John Evans** **Date** **30-Oct-12**
Reference: Horslev 1951
Time Lag and Soil Permeability in Groundwater Observations
Bulletin No. 36, Waterways Experiment Station, Mississippi.

Time (seconds)	TIME (minutes)	h (metres)	h/h0
0	0.00	0.34	1.00
60	1.00	0.34	1.00
120	2.00	0.34	1.00
180	3.00	0.33	0.97
240	4.00	0.33	0.97
300	5.00	0.33	0.97
600	10.00	0.32	0.94
900	15.00	0.31	0.91
1200	20.00	0.30	0.88
1500	25.00	0.29	0.85
1800	30.00	0.28	0.82
2700	45.00	0.26	0.76
3600	60.00	0.24	0.71



Chord Environmental

Rising Head Data - Calculations using Horslev Test (1951)

Client: Geotechnical and Environmental Associates
Project: 59 Maresfield Gardens
Project No.: 1102
Borehole No. BH3

Abbreviations

L	Length of test section
D	Borehole diameter
d	Stand Pipe diameter
m	Permeability transformation ratio
h0 =	excess head at time t0 (m)
h =	excess head at time t (m)
t1 =	time at t1 (minutes)
h1 =	excess head at time t1 (m)
t2 =	time at t2 (minutes)
h2 =	excess head at time t2 (m)
K =	hydraulic conductivity (m/d)

All depths in metres below datum (borehole cover).

Calculations

FORMULA APPLIED = k = d**2*ln(2mL/D)*ln(h1/h2)/8*L(t2-t1)

NB Only applicable when mL/D>4 See Horslev 1951, pg 44 equation G.

Analysis

BH3	Section Tested	4.51 - 8.65	mBD
	Borehole Depth	8.65	mBD
	Length of test section (L)	4.14	m
	Borehole diameter (D)	0.1	m
	Standpipe diameter (d)	0.05	m
	Transformation ratio (m)	1	
	Depth to rest water level	4.51	mBD
	Water level at test start (mbd)	8.30	mBD

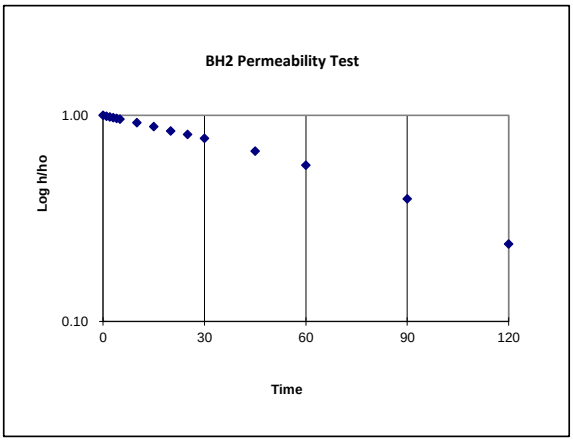
Selected Values

t1=	0.00	minutes
h1=	3.79	m
t2=	120.00	minutes
h2=	0.90	m

PERMEABILITY OF BOREHOLE SECTION: **0.005751 m/day**
6.66E-08 m/sec

Prepared by: John Evans **Date** 30-Oct-12
Reference: Horslev 1951
Time Lag and Soil Permeability in Groundwater Observations
Bulletin No. 36, Waterways Experiment Station, Mississippi.

Time (seconds)	TIME (minutes)	h (metres)	h/h0
0	0.00	3.79	1.00
60	1.00	3.75	0.99
120	2.00	3.72	0.98
180	3.00	3.69	0.97
240	4.00	3.66	0.97
300	5.00	3.63	0.96
600	10.00	3.49	0.92
900	15.00	3.34	0.88
1200	20.00	3.18	0.84
1500	25.00	3.06	0.81
1800	30.00	2.93	0.77
2700	45.00	2.54	0.67
3600	60.00	2.17	0.57
5400	90.00	1.49	0.39
7200	120.00	0.9	0.24



APPENDIX 4

Summary Sheets from Retaining Wall Design Calculations

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	84.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES

No.	-- Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	------- Soil type ------- Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	80.10	80.10	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	77.00	77.00	0.0	WC
5	1	81.00	81.00	0.0	1	75.75	75.75	0.0	MC
6	1	82.00	82.00	0.0	1	75.25	75.25	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 70.00
Maximum finite element length = 0.80 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	2.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	76.00	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.100000	2.000E+08	4.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	83.85	1.00	0.100000	2.000E+08	4.00	0.00	0	No
9	84.45	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	84.00	0.00(A)	8.00	20.00	5.00	=	N/A	1.00 Var
2	84.00	5.00(A)	8.00	15.00	5.00	=	N/A	1.00 Var
3	84.00	1.00(A)	8.00	4.00	0.00	17.00	N/A	1.00 P/U
4	84.00	5.00(A)	8.00	10.00	17.00	=	N/A	1.00 P/U
5	83.00	5.00(A)	2.00	2.00	25.00	=	N/A	1.00 P/U
6	75.75	-0.00(P)	8.00	10.00	52.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
A trapezoidal surcharge is defined by two values:
N = at edge near to wall, F = at edge far from wall
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 84.00
2	Apply surcharge no.2 at elevation 84.00
3	Apply surcharge no.3 at elevation 84.00
4	Apply surcharge no.4 at elevation 84.00
5	Apply surcharge no.5 at elevation 83.00
6	Install strut or anchor no.1 at elevation 84.40
7	Apply water pressure profile no.1 (Mod. Conserv.) No analysis at this stage
8	Excavate to elevation 80.60 on PASSIVE side
9	Install strut or anchor no.2 at elevation 81.10
10	Apply water pressure profile no.3 (Mod. Conserv.)
11	Excavate to elevation 77.50 on PASSIVE side
12	Install strut or anchor no.3 at elevation 78.00
13	Apply water pressure profile no.5 (Mod. Conserv.)
14	Excavate to elevation 75.75 on PASSIVE side
15	Install strut or anchor no.4 at elevation 76.00
16	Apply surcharge no.6 at elevation 75.75
17	Install strut or anchor no.5 at elevation 79.50
18	Remove strut or anchor no.3 at elevation 78.00
19	Install strut or anchor no.6 at elevation 78.95
20	Remove strut or anchor no.5 at elevation 79.50
21	Install strut or anchor no.7 at elevation 81.75
22	Remove strut or anchor no.2 at elevation 81.10
23	Install strut or anchor no.8 at elevation 83.85
24	Remove strut or anchor no.1 at elevation 84.40
25	Install strut or anchor no.9 at elevation 84.45
26	Remove strut or anchor no.8 at elevation 83.85
27	Change EI of wall to 46970 kN.m2/m run Yield moment not defined No adjustments to wall displacements
28	Change properties of soil type 1 to soil type 4 Ko pressures will be reset
29	Change properties of soil type 2 to soil type 5 Ko pressures will be reset
30	Change properties of soil type 3 to soil type 6 Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: Serviceability Limit State
All loads and soil strengths are unfactored

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 84.00	No	No	No
2	Apply surcharge no.2 at elev. 84.00	No	No	No
3	Apply surcharge no.3 at elev. 84.00	No	No	No
4	Apply surcharge no.4 at elev. 84.00	No	No	No
5	Apply surcharge no.5 at elev. 83.00	No	No	No
6	Install strut no.1 at elev. 84.40	No	No	No
7	Apply water pressure profile no.1	No	No	No
8	Excav. to elev. 80.60 on PASSIVE side	Yes	No	No
9	Install strut no.2 at elev. 81.10	No	No	No
10	Apply water pressure profile no.3	No	No	No
11	Excav. to elev. 77.50 on PASSIVE side	Yes	No	No
12	Install strut no.3 at elev. 78.00	No	No	No
13	Apply water pressure profile no.5	No	No	No
14	Excav. to elev. 75.75 on PASSIVE side	Yes	No	No
15	Install strut no.4 at elev. 76.00	No	No	No
16	Apply surcharge no.6 at elev. 75.75	No	No	No
17	Install strut no.5 at elev. 79.50	No	No	No
18	Remove strut no.3 at elev. 78.00	No	No	No
19	Install strut no.6 at elev. 78.95	No	No	No
20	Remove strut no.5 at elev. 79.50	No	No	No
21	Install strut no.7 at elev. 81.75	No	No	No
22	Remove strut no.2 at elev. 81.10	No	No	No
23	Install strut no.8 at elev. 83.85	No	No	No
24	Remove strut no.1 at elev. 84.40	Yes	No	No
25	Install strut no.9 at elev. 84.45	No	No	No
26	Remove strut no.8 at elev. 83.85	No	No	No
27	Change EI of wall to 46970kN.m2/m run	No	No	No
28	Change soil type 1 to soil type 4	No	No	No
29	Change soil type 2 to soil type 5	No	No	No
30	Change soil type 3 to soil type 6	Yes	No	No
*	Summary output	Yes	-	Yes

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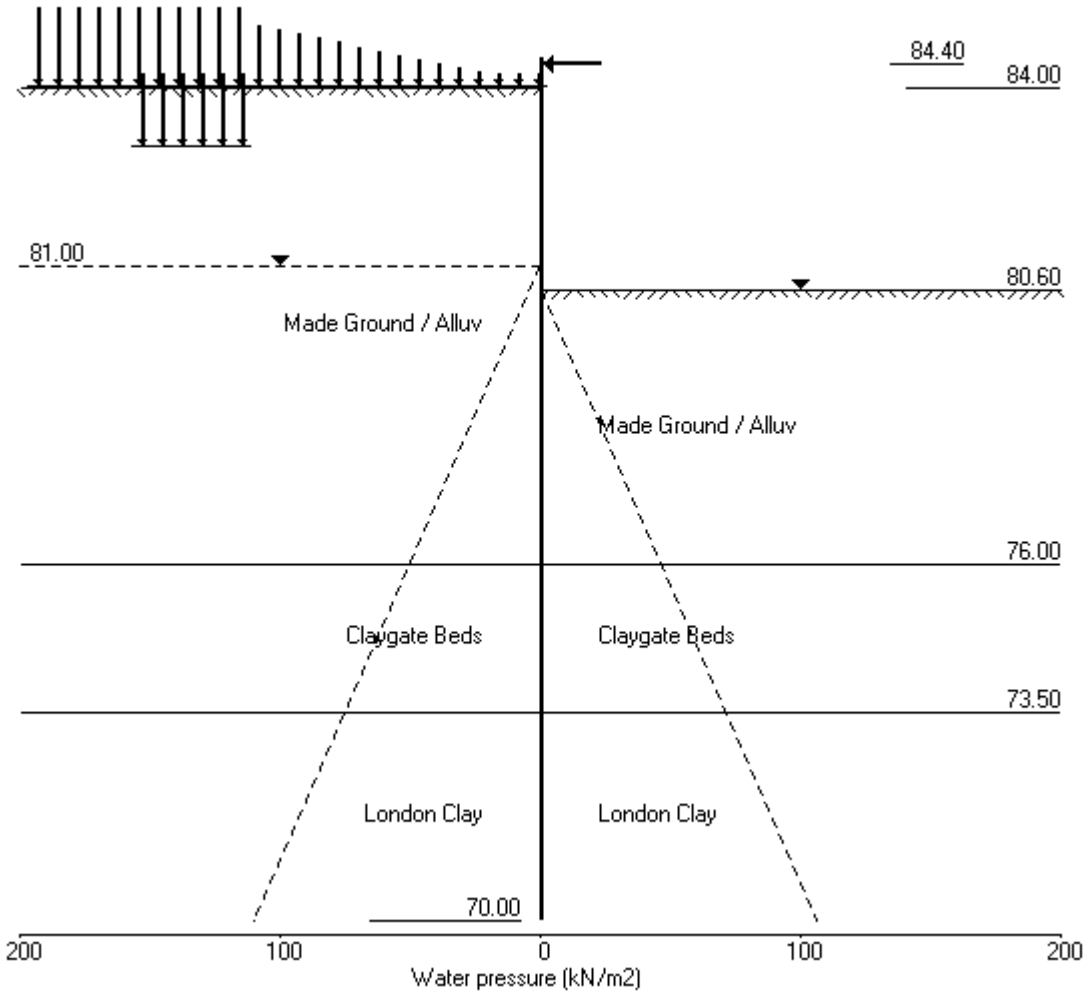
Units: kN,m

Stage No.8 Excav. to elev. 80.60 on PASSIVE side



Units: kN,m

Stage No. 8 Excavate to elevation 80.60 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
8	84.00	80.60	84.40	3.392	n/a	80.23	0.37

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-2.24E-03	0.0	0.0		93940
2	84.40	0.00	0.001	-2.24E-03	0.0	-0.0	23.5	93940
		0.00	0.001	-2.24E-03	-23.5	-0.0		
3	84.00	0.00	0.002	-2.22E-03	-23.5	-9.4		93940
4	83.85	0.75	0.002	-2.21E-03	-23.4	-12.9		93940
5	83.43	2.87	0.003	-2.13E-03	-22.7	-22.7		93940
6	83.00	5.00	0.004	-2.00E-03	-21.0	-32.0		93940
7	82.38	8.13	0.005	-1.75E-03	-16.9	-44.0		93940
8	81.75	11.25	0.006	-1.43E-03	-10.8	-52.7		93940
9	81.10	14.50	0.007	-1.05E-03	-2.5	-57.1		93940
10	81.00	15.00	0.007	-9.91E-04	-1.0	-57.3		93940
11	80.60	17.00	0.007	-7.49E-04	5.4	-56.4		93940
		-6.05	0.007	-7.49E-04	5.4	-56.4		
12	80.05	-5.82	0.008	-4.28E-04	2.1	-53.2		93940
13	79.50	-1.96	0.008	-1.18E-04	-0.0	-52.7		93940
14	78.95	2.94	0.008	1.89E-04	0.3	-52.7		93940
15	78.47	8.01	0.008	4.54E-04	2.9	-52.1		93940
16	78.00	13.84	0.007	7.12E-04	8.1	-49.7		93940
17	77.50	17.37	0.007	9.61E-04	15.9	-43.9		93940
18	76.75	22.58	0.006	1.24E-03	30.8	-27.2		93940
19	76.00	28.58	0.005	1.34E-03	50.0	2.2		93940
		-45.54	0.005	1.34E-03	50.0	2.2		
20	75.75	-40.85	0.005	1.32E-03	39.2	13.3		93940
21	75.08	-28.15	0.004	1.16E-03	15.9	30.4		93940
22	74.40	-16.91	0.003	9.34E-04	0.7	34.6		93940
23	73.95	-10.79	0.003	7.72E-04	-5.5	33.2		93940
24	73.50	-5.91	0.003	6.21E-04	-9.3	29.6		93940
25	72.75	-0.03	0.002	4.20E-04	-11.5	20.9		93940
26	72.00	3.21	0.002	2.89E-04	-10.3	12.1		93940
27	71.20	4.97	0.002	2.17E-04	-7.0	4.7		93940

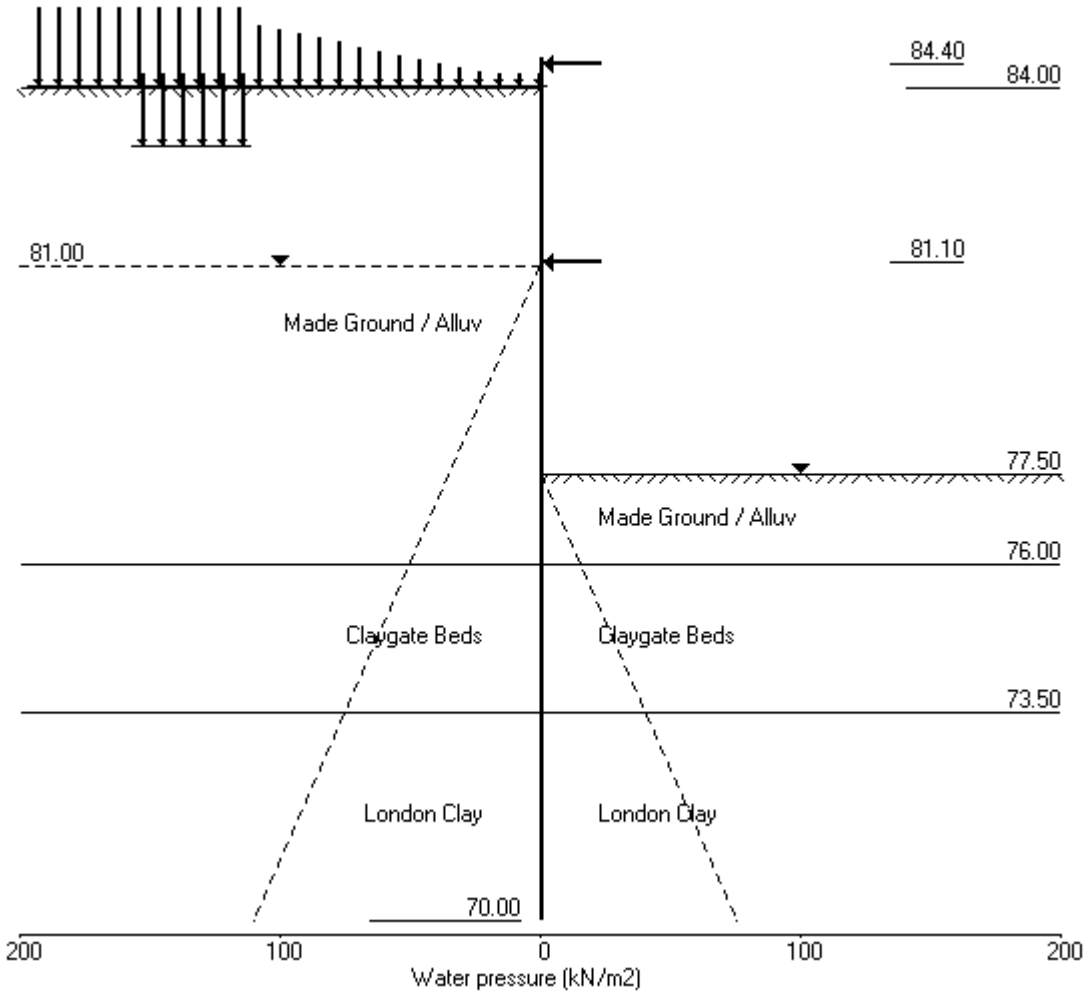
(continued)

Stage No.8 Excavate to elevation 80.60 on PASSIVE side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
28	70.60	5.85	0.002	1.98E-04	-3.8	1.3		93940
29	70.00	6.75	0.001	1.94E-04	-0.0	0.0		---
At elev. 84.40 Strut force =				70.5 kN/strut =		23.5 kN/m run		

Units: kN,m

Stage No.11 Excav. to elev. 77.50 on PASSIVE side



Units: kN,m

Stage No. 11 Excavate to elevation 77.50 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
11	84.00	77.50		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-1.92E-03	0.0	0.0		93940
2	84.40	0.00	0.001	-1.92E-03	0.0	-0.0	1.7	93940
		0.00	0.001	-1.92E-03	-1.7	-0.0		
3	84.00	0.00	0.002	-1.92E-03	-1.7	-0.7		93940
		1.11	0.002	-1.92E-03	-1.7	-0.7		
4	83.85	2.12	0.002	-1.92E-03	-1.5	-0.9		93940
5	83.43	4.88	0.003	-1.91E-03	-0.0	-1.3		93940
6	83.00	7.39	0.003	-1.91E-03	2.6	-0.8		93940
7	82.38	10.42	0.005	-1.91E-03	8.2	2.5		93940
8	81.75	12.33	0.006	-1.95E-03	15.3	9.8		93940
9	81.10	14.50	0.007	-2.07E-03	24.0	22.6	102.5	93940
		14.50	0.007	-2.07E-03	-78.5	22.6		
10	81.00	15.00	0.007	-2.09E-03	-77.1	14.8		93940
11	80.60	17.00	0.008	-2.09E-03	-70.7	-14.7		93940
12	80.05	19.75	0.009	-1.90E-03	-60.5	-49.7		93940
13	79.50	22.50	0.010	-1.52E-03	-48.9	-79.8		93940
14	78.95	30.44	0.011	-9.87E-04	-34.4	-103.0		93940
15	78.47	38.57	0.011	-4.35E-04	-18.0	-115.6		93940
16	78.00	46.66	0.011	1.59E-04	2.3	-119.5		93940
17	77.50	55.12	0.011	7.76E-04	27.7	-112.4		93940
		37.87	0.011	7.76E-04	27.7	-112.4		
18	76.75	46.98	0.010	1.54E-03	59.5	-80.6		93940
19	76.00	57.28	0.009	1.95E-03	98.6	-22.6		93940
		-79.06	0.009	1.95E-03	98.6	-22.6		
20	75.75	-72.20	0.008	1.98E-03	79.7	-0.4		93940
21	75.08	-52.16	0.007	1.85E-03	37.7	36.9		93940
22	74.40	-33.15	0.006	1.54E-03	9.0	50.4		93940
23	73.95	-22.35	0.005	1.30E-03	-3.5	51.1		93940
24	73.50	-13.50	0.005	1.06E-03	-11.6	47.2		93940
25	72.75	-2.35	0.004	7.39E-04	-17.6	34.5		93940

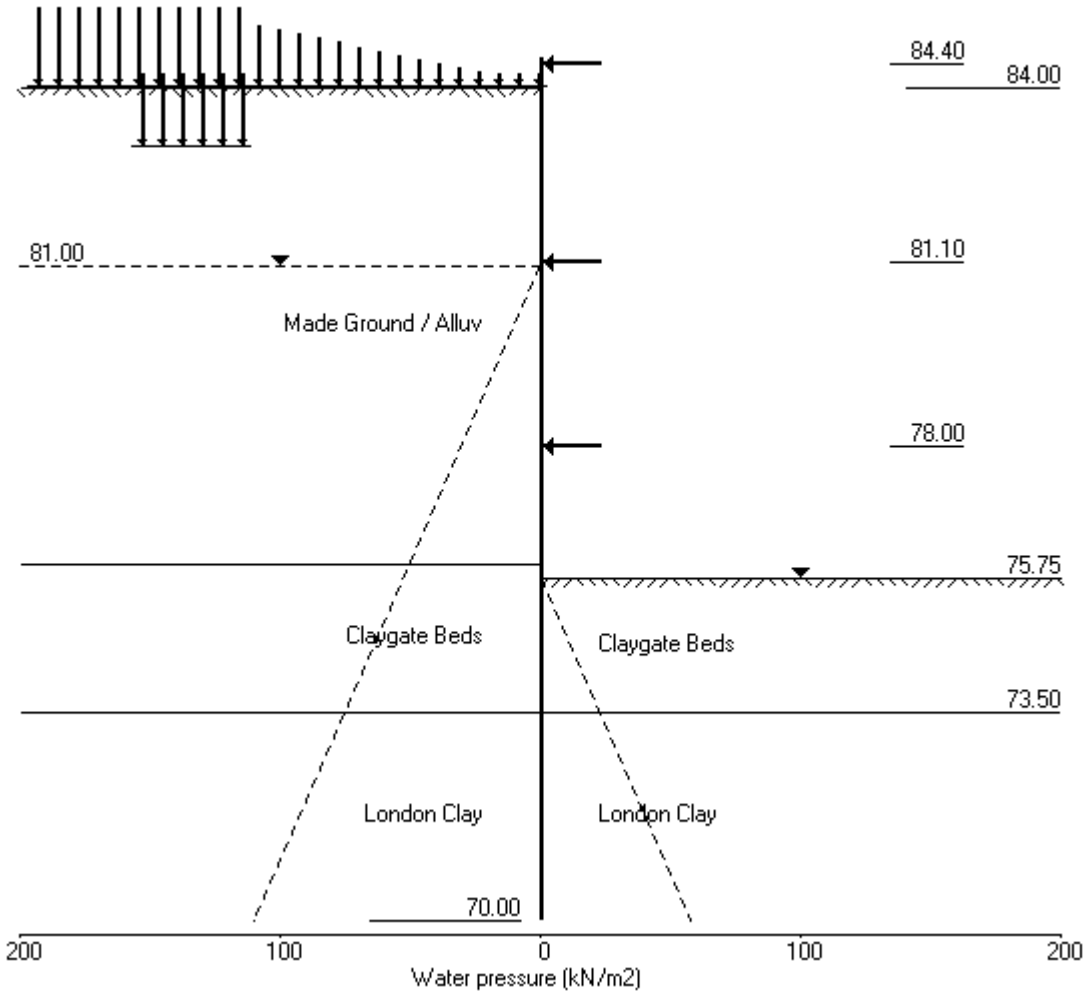
(continued)

Stage No.11 Excavate to elevation 77.50 on PASSIVE side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
26	72.00	4.19	0.004	5.19E-04	-16.9	20.5		93940
27	71.20	8.02	0.003	3.97E-04	-12.0	8.1		93940
28	70.60	9.99	0.003	3.64E-04	-6.6	2.3		93940
29	70.00	11.92	0.003	3.57E-04	0.0	0.0		---
At elev. 84.40 Strut force = 5.2 kN/strut = 1.7 kN/m run								
At elev. 81.10 Strut force = 307.5 kN/strut = 102.5 kN/m run								

Units: kN,m

Stage No.14 Excav. to elev. 75.75 on PASSIVE side



Units: kN,m

Stage No. 14 Excavate to elevation 75.75 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
14	84.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-1.92E-03	0.0	0.0		93940
2	84.40	0.00	0.001	-1.92E-03	0.0	-0.0	2.4	93940
		0.00	0.001	-1.92E-03	-2.4	-0.0		
3	84.00	0.00	0.002	-1.92E-03	-2.4	-0.9		93940
		1.09	0.002	-1.92E-03	-2.4	-0.9		
4	83.85	2.10	0.002	-1.92E-03	-2.1	-1.3		93940
5	83.43	4.85	0.003	-1.91E-03	-0.6	-1.9		93940
6	83.00	7.38	0.003	-1.90E-03	2.0	-1.7		93940
7	82.38	10.45	0.005	-1.90E-03	7.5	1.2		93940
8	81.75	12.43	0.006	-1.93E-03	14.7	8.2		93940
9	81.10	14.71	0.007	-2.03E-03	23.5	20.6	91.5	93940
		14.71	0.007	-2.03E-03	-68.0	20.6		
10	81.00	15.23	0.007	-2.05E-03	-66.5	13.9		93940
11	80.60	17.32	0.008	-2.05E-03	-60.0	-11.5		93940
12	80.05	20.13	0.009	-1.90E-03	-49.7	-40.5		93940
13	79.50	22.74	0.010	-1.59E-03	-37.9	-64.6		93940
14	78.95	30.44	0.011	-1.17E-03	-23.3	-81.7		93940
15	78.47	38.57	0.011	-7.39E-04	-6.9	-89.0		93940
16	78.00	46.66	0.012	-2.92E-04	13.3	-87.7	54.3	93940
		46.66	0.012	-2.92E-04	-40.9	-87.7		
17	77.50	55.12	0.012	2.12E-04	-15.5	-102.1		93940
18	76.75	67.74	0.011	1.00E-03	30.6	-97.6		93940
19	76.00	80.29	0.010	1.62E-03	86.1	-55.2		93940
		40.00	0.010	1.62E-03	86.1	-55.2		
20	75.75	45.65	0.010	1.73E-03	96.8	-32.3		93940
		-73.23	0.010	1.73E-03	96.8	-32.3		
21	75.08	-56.81	0.009	1.79E-03	52.9	16.3		93940
22	74.40	-39.08	0.008	1.59E-03	20.6	39.1		93940
23	73.95	-28.27	0.007	1.39E-03	5.4	44.4		93940
24	73.50	-18.97	0.006	1.18E-03	-5.2	43.9		93940

(continued)

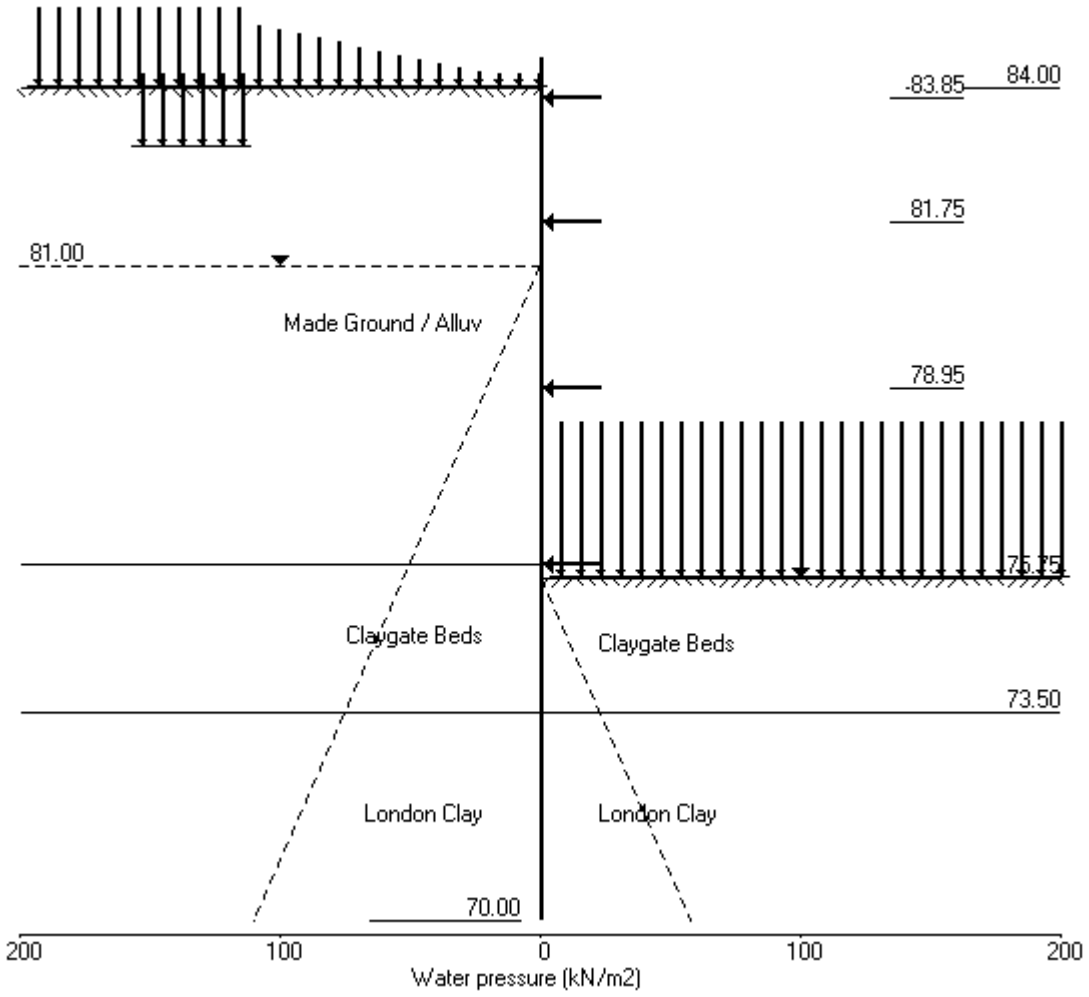
Stage No.14 Excavate to elevation 75.75 on PASSIVE side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
25	72.75	-6.31	0.005	8.70E-04	-14.7	34.6		93940
26	72.00	1.90	0.005	6.45E-04	-16.4	21.6		93940
27	71.20	7.41	0.004	5.15E-04	-12.6	8.9		93940
28	70.60	10.55	0.004	4.79E-04	-7.2	2.6		93940
29	70.00	13.62	0.004	4.70E-04	0.0	0.0		---

At elev. 84.40 Strut force = 7.1 kN/strut = 2.4 kN/m run
At elev. 81.10 Strut force = 274.6 kN/strut = 91.5 kN/m run
At elev. 78.00 Strut force = 162.8 kN/strut = 54.3 kN/m run

Units: kN,m

Stage No.24 Remove strut no.1 at elev. 84.40



Units: kN,m

Stage No. 24 Remove strut or anchor no.1 at elevation 84.40

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
24	84.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.000	-2.08E-03	0.0	0.0		93940
2	84.40	0.00	0.000	-2.08E-03	0.0	-0.0		93940
3	84.00	0.00	0.001	-2.08E-03	0.0	-0.0		93940
		4.84	0.001	-2.08E-03	0.0	-0.0		
4	83.85	5.65	0.001	-2.08E-03	0.8	0.1	-0.0	93940
5	83.43	7.82	0.002	-2.08E-03	3.6	1.0		93940
6	83.00	9.73	0.003	-2.09E-03	7.4	3.3		93940
7	82.38	11.74	0.005	-2.13E-03	14.1	10.1		93940
8	81.75	12.39	0.006	-2.24E-03	21.6	21.4	80.6	93940
		12.39	0.006	-2.24E-03	-58.9	21.4		
9	81.10	14.50	0.007	-2.26E-03	-50.2	-14.1		93940
10	81.00	15.00	0.008	-2.25E-03	-48.7	-19.0		93940
11	80.60	17.00	0.008	-2.13E-03	-42.3	-37.3		93940
12	80.05	19.75	0.010	-1.85E-03	-32.2	-56.7		93940
13	79.50	22.50	0.010	-1.48E-03	-20.6	-71.2		93940
14	78.95	30.44	0.011	-1.04E-03	-6.0	-78.7	53.6	93940
		30.44	0.011	-1.04E-03	-59.6	-78.7		
15	78.47	38.89	0.012	-5.83E-04	-43.2	-103.4		93940
16	78.00	47.19	0.012	-2.04E-05	-22.7	-119.3		93940
17	77.50	55.76	0.012	6.28E-04	3.0	-124.5		93940
18	76.75	69.55	0.011	1.54E-03	50.0	-105.9		93940
19	76.00	83.60	0.009	2.16E-03	107.4	-48.4	-0.0	93940
		49.93	0.009	2.16E-03	107.4	-48.4		
20	75.75	57.27	0.009	2.25E-03	120.8	-19.9		93940
		-101.25	0.009	2.25E-03	120.8	-19.9		
21	75.08	-75.57	0.007	2.18E-03	61.2	38.6		93940
22	74.40	-49.90	0.006	1.82E-03	18.8	62.7		93940
23	73.95	-34.72	0.005	1.51E-03	-0.2	66.1		93940
24	73.50	-21.86	0.005	1.20E-03	-13.0	62.5		93940
25	72.75	-5.36	0.004	7.71E-04	-23.2	46.8		93940

(continued)

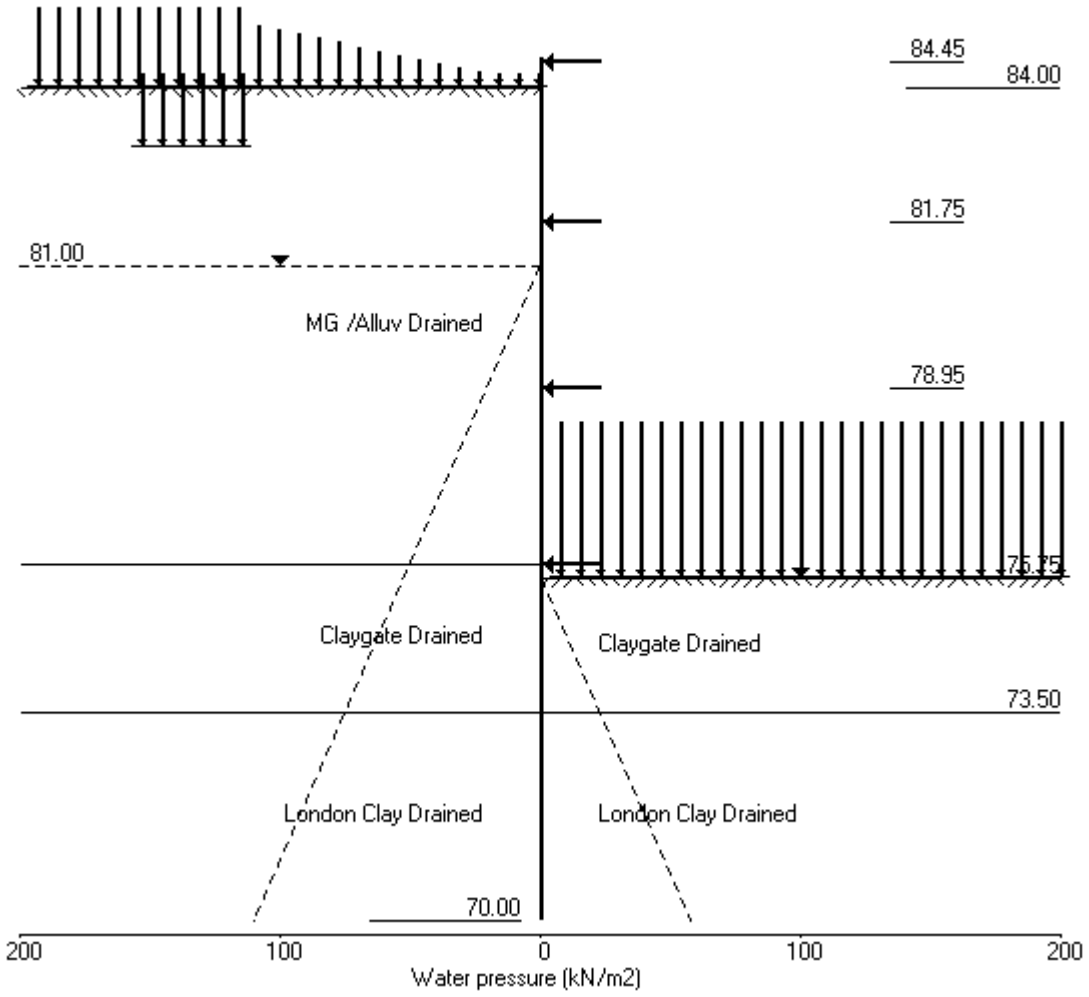
Stage No.24 Remove strut or anchor no.1 at elevation 84.40

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
26	72.00	4.90	0.003	4.72E-04	-23.3	28.0		93940
27	71.20	11.17	0.003	3.05E-04	-16.9	11.1		93940
28	70.60	14.22	0.003	2.60E-04	-9.3	3.0		93940
29	70.00	16.77	0.003	2.51E-04	0.0	0.0		---

At elev. 83.85 The strut is slack
At elev. 81.75 Strut force = 80.6 kN/strut = 80.6 kN/m run
At elev. 78.95 Strut force = 53.6 kN/strut = 53.6 kN/m run
At elev. 76.00 The strut is slack

Units: kN,m

Stage No.30 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 30 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
30	84.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall
Limit State: Serviceability Limit State
Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.000	-2.13E-03	0.0	0.0	-0.0	46970
2	84.40	0.00	0.000	-2.13E-03	0.0	-0.0		46970
3	84.00	0.00	0.001	-2.13E-03	0.0	-0.0		46970
		5.34	0.001	-2.13E-03	0.0	-0.0		
4	83.85	6.12	0.001	-2.13E-03	0.9	0.1		46970
5	83.43	8.21	0.002	-2.13E-03	3.9	1.1		46970
6	83.00	11.55	0.003	-2.14E-03	8.1	3.6		46970
7	82.38	17.10	0.004	-2.20E-03	17.1	11.4		46970
8	81.75	22.62	0.006	-2.34E-03	29.5	25.9	106.8	46970
		22.62	0.006	-2.34E-03	-77.4	25.9		
9	81.10	28.24	0.007	-2.36E-03	-60.8	-19.1		46970
10	81.00	29.11	0.008	-2.34E-03	-58.0	-25.0		46970
11	80.60	34.60	0.009	-2.15E-03	-45.2	-45.8		46970
12	80.05	42.24	0.010	-1.79E-03	-24.1	-63.9		46970
13	79.50	49.98	0.011	-1.38E-03	1.3	-70.3		46970
14	78.95	57.58	0.011	-1.04E-03	30.8	-61.7	116.2	46970
		57.58	0.011	-1.04E-03	-85.3	-61.7		
15	78.47	64.02	0.012	-7.12E-04	-56.5	-95.5		46970
16	78.00	70.33	0.012	-2.11E-04	-24.6	-115.0		46970
17	77.50	76.78	0.012	3.81E-04	12.2	-118.3		46970
18	76.75	86.28	0.011	1.10E-03	73.4	-87.2		46970
19	76.00	95.11	0.010	1.24E-03	141.4	-7.9	129.0	46970
		140.93	0.010	1.24E-03	12.4	-7.9		
20	75.75	143.39	0.010	1.17E-03	47.9	-0.3		46970
		-31.18	0.010	1.17E-03	47.9	-0.3		
21	75.08	-26.34	0.009	1.07E-03	28.5	23.9		46970
22	74.40	-20.73	0.009	1.00E-03	12.6	36.1		46970
23	73.95	-16.62	0.008	9.55E-04	4.2	39.4		46970
24	73.50	-12.43	0.008	8.85E-04	-2.3	39.4		46970
		-14.56	0.008	8.85E-04	-2.3	39.4		

(continued)

Stage No.30 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
25	72.75	-7.03	0.007	7.48E-04	-10.4	32.4		46970
26	72.00	-0.65	0.007	6.14E-04	-13.3	21.7		46970
27	71.20	4.52	0.006	5.08E-04	-11.7	10.3		46970
28	70.60	8.37	0.006	4.63E-04	-7.9	3.8		46970
29	70.00	17.90	0.006	4.49E-04	0.0	0.0		---

At elev. 84.45 The strut is slack
At elev. 81.75 Strut force = 106.8 kN/strut = 106.8 kN/m run
At elev. 78.95 Strut force = 116.2 kN/strut = 116.2 kN/m run
At elev. 76.00 Strut force = 129.0 kN/strut = 129.0 kN/m run

Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: Serviceability Limit State

All loads and soil strengths are unfactored

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
1	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
2	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
3	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
4	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
5	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
6	84.00	84.00		No analysis at this stage			
7	84.00	84.00		No analysis at this stage			
8	84.00	80.60	84.40	3.392	n/a	80.23	0.37
9	84.00	80.60		No analysis at this stage			

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment Calculated		Bending moment Factored		Shear force Calculated		Shear force Factored	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
		m	m	kN.m/m		kN.m/m		kN/m	kN/m	kN/m	kN/m
1	84.45	0.001	0.000	0	0	0	0	0	0	0	0
2	84.40	0.001	0.000	0	-0	0	-0	0	-23	0	-32
3	84.00	0.002	0.000	0	-9	0	-13	0	-23	0	-32
4	83.85	0.002	0.000	0	-13	0	-17	1	-23	1	-32
5	83.43	0.003	0.000	1	-23	1	-31	4	-23	5	-31
6	83.00	0.004	0.000	4	-32	5	-43	8	-21	11	-28
7	82.38	0.005	0.000	11	-44	15	-59	17	-17	23	-23
8	81.75	0.006	0.000	26	-53	35	-71	29	-77	40	-104
9	81.10	0.007	0.000	25	-57	34	-77	25	-79	34	-106
10	81.00	0.008	0.000	18	-57	24	-77	0	-77	0	-104
11	80.60	0.009	0.000	0	-56	0	-76	5	-71	7	-95
12	80.05	0.010	0.000	0	-64	0	-86	2	-61	3	-82
13	79.50	0.011	0.000	0	-80	0	-108	4	-69	6	-93
14	78.95	0.011	0.000	0	-103	0	-139	34	-103	46	-139
15	78.47	0.012	0.000	0	-116	0	-157	3	-75	4	-101
16	78.00	0.012	0.000	0	-130	0	-175	13	-43	18	-58
17	77.50	0.012	0.000	0	-137	0	-185	28	-15	37	-21
18	76.75	0.011	0.000	0	-120	0	-162	73	0	99	0
19	76.00	0.010	0.000	2	-55	3	-75	141	0	191	0
20	75.75	0.010	0.000	13	-32	18	-44	135	0	182	0
21	75.08	0.009	0.000	42	0	56	0	67	0	90	0
22	74.40	0.009	0.000	67	0	91	0	27	-0	37	-0
23	73.95	0.008	0.000	70	0	95	0	26	-6	35	-7
24	73.50	0.008	0.000	66	0	89	0	30	-15	41	-20
25	72.75	0.007	0.000	55	0	74	0	0	-25	0	-34
26	72.00	0.007	0.000	41	0	55	0	0	-25	0	-33
27	71.20	0.006	0.000	20	0	26	0	0	-24	0	-32
28	70.60	0.006	0.000	7	0	9	0	0	-16	0	-22
29	70.00	0.006	0.000	0	0	0	0	0	-0	0	-0

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment						Shear force					
	Calculated				Factored		Calculated				Factored	
	max. kN.m/m	elev.	min. kN.m/m	elev.	max. kN.m/m	min.	max. kN/m	elev.	min. kN/m	elev.	max. kN/m	min. kN/m
1	2	75.08	-1	79.50	3	-1	2	76.00	-1	72.75	3	-1
2	2	74.40	-1	78.95	3	-2	2	76.00	-1	72.75	3	-1
3	4	74.40	-4	78.95	5	-6	4	76.00	-1	81.75	6	-2
4	5	74.40	-6	78.47	6	-8	6	76.00	-2	81.10	8	-2
5	5	74.40	-6	78.47	6	-9	7	76.00	-2	81.10	9	-3
6	No calculation at this stage											
7	No calculation at this stage											
8	35	74.40	-57	81.00	47	-77	50	76.00	-23	84.40	68	-32
9	No calculation at this stage											
10	34	74.40	-57	81.00	46	-77	50	76.00	-23	84.40	67	-32
11	51	73.95	-120	78.00	69	-161	99	76.00	-79	81.10	133	-106
12	No calculation at this stage											
13	51	73.95	-119	78.00	69	-161	98	76.00	-78	81.10	133	-106
14	44	73.95	-102	77.50	60	-138	97	75.75	-68	81.10	131	-92
15	No calculation at this stage											
16	65	73.95	-119	77.50	87	-161	118	75.75	-76	81.10	159	-103
17	No calculation at this stage											
18	68	73.95	-132	77.50	92	-179	124	75.75	-69	79.50	168	-93
19	No calculation at this stage											
20	67	73.95	-130	77.50	91	-176	123	75.75	-74	81.10	167	-99
21	No calculation at this stage											
22	66	73.95	-125	77.50	89	-168	121	75.75	-60	78.95	163	-81
23	No calculation at this stage											
24	66	73.95	-125	77.50	89	-168	121	75.75	-60	78.95	163	-81
25	No calculation at this stage											
26	66	73.95	-125	77.50	89	-168	121	75.75	-60	78.95	163	-81
27	No calculation at this stage											
28	70	73.95	-137	77.50	95	-185	135	75.75	-103	78.95	182	-139
29	55	72.75	-125	77.50	74	-169	132	76.00	-94	78.95	178	-126
30	39	73.50	-118	77.50	53	-160	141	76.00	-85	78.95	191	-115

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	elev.	minimum m	elev.	Stage description
1	0.001	84.45	0.000	84.45	Apply surcharge no.1 at elev. 84.00
2	0.001	84.45	0.000	84.45	Apply surcharge no.2 at elev. 84.00
3	0.001	81.00	0.000	84.45	Apply surcharge no.3 at elev. 84.00
4	0.001	80.05	0.000	84.45	Apply surcharge no.4 at elev. 84.00
5	0.001	80.05	0.000	84.45	Apply surcharge no.5 at elev. 83.00
6	No calculation at this stage				Install strut no.1 at elev. 84.40
7	No calculation at this stage				Apply water pressure profile no.1
8	0.008	79.50	0.000	84.45	Excav. to elev. 80.60 on PASSIVE side
9	No calculation at this stage				Install strut no.2 at elev. 81.10
10	0.008	79.50	0.000	84.45	Apply water pressure profile no.3
11	0.011	78.00	0.000	84.45	Excav. to elev. 77.50 on PASSIVE side
12	No calculation at this stage				Install strut no.3 at elev. 78.00
13	0.011	78.00	0.000	84.45	Apply water pressure profile no.5
14	0.012	77.50	0.000	84.45	Excav. to elev. 75.75 on PASSIVE side
15	No calculation at this stage				Install strut no.4 at elev. 76.00
16	0.012	78.00	0.000	84.45	Apply surcharge no.6 at elev. 75.75
17	No calculation at this stage				Install strut no.5 at elev. 79.50
18	0.012	78.00	0.000	84.45	Remove strut no.3 at elev. 78.00
19	No calculation at this stage				Install strut no.6 at elev. 78.95
20	0.012	78.00	0.000	84.45	Remove strut no.5 at elev. 79.50
21	No calculation at this stage				Install strut no.7 at elev. 81.75
22	0.012	78.00	0.000	84.45	Remove strut no.2 at elev. 81.10
23	No calculation at this stage				Install strut no.8 at elev. 83.85
24	0.012	78.00	0.000	84.45	Remove strut no.1 at elev. 84.40
25	No calculation at this stage				Install strut no.9 at elev. 84.45
26	0.012	78.00	0.000	84.45	Remove strut no.8 at elev. 83.85
27	No calculation at this stage				Change EI of wall to 46970kN.m2/m run
28	0.012	78.00	0.000	84.45	Change soil type 1 to soil type 4
29	0.012	77.50	0.000	84.45	Change soil type 2 to soil type 5
30	0.012	78.00	0.000	84.45	Change soil type 3 to soil type 6

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev. 84.40			Strut no. 2 at elev. 81.10			Strut no. 3 at elev. 78.00		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
8	23	70	95	---	---	---	---	---	---
10	23	70	95	slack	slack	slack	---	---	---
11	2	5	7	103	308	415	---	---	---
13	2	5	7	102	307	415	0	1	2
14	2	7	10	92	275	371	54	163	220
16	2	5	6	101	302	408	31	94	126
18	2	5	7	91	274	370	---	---	---
20	1	3	5	98	295	399	---	---	---
22	slack	slack	slack	---	---	---	---	---	---

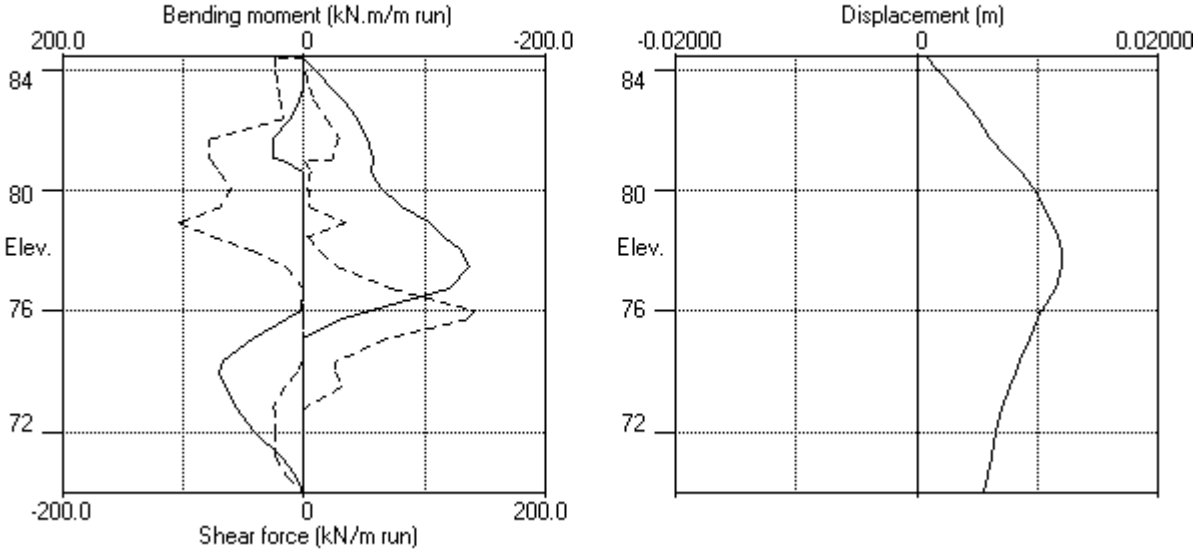
Stage no.	Strut no. 4 at elev. 76.00			Strut no. 5 at elev. 79.50			Strut no. 6 at elev. 78.95		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
16	slack	slack	slack	---	---	---	---	---	---
18	slack	slack	slack	32	95	129	---	---	---
20	slack	slack	slack	---	---	---	26	26	35
22	slack	slack	slack	---	---	---	54	54	72
24	slack	slack	slack	---	---	---	54	54	72
26	slack	slack	slack	---	---	---	54	54	72
28	slack	slack	slack	---	---	---	137	137	185
29	115	115	155	---	---	---	127	127	171
30	129	129	174	---	---	---	116	116	157

Stage no.	Strut no. 7 at elev. 81.75			Strut no. 8 at elev. 83.85			Strut no. 9 at elev. 84.45		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
22	81	81	109	---	---	---	---	---	---
24	81	81	109	slack	slack	slack	---	---	---
26	81	81	109	---	---	---	slack	slack	slack
28	104	104	140	---	---	---	slack	slack	slack
29	105	105	141	---	---	---	slack	slack	slack
30	107	107	144	---	---	---	slack	slack	slack

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	84.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES (Unfactored SLS soil strengths)

No.	Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type ------- Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	80.10	80.10	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	77.00	77.00	0.0	WC
5	1	81.00	81.00	0.0	1	75.75	75.75	0.0	MC
6	1	82.00	82.00	0.0	1	75.25	75.25	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 70.00
Maximum finite element length = 0.80 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	2.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	76.00	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.100000	2.000E+08	4.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	83.85	1.00	0.100000	2.000E+08	4.00	0.00	0	No
9	84.45	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	84.00	0.00(A)	8.00	20.00	5.00	=	N/A	1.10 Var
2	84.00	5.00(A)	8.00	15.00	5.00	=	N/A	1.10 Var
3	84.00	1.00(A)	8.00	4.00	0.00	17.00	N/A	1.00 P/U
4	84.00	5.00(A)	8.00	10.00	17.00	=	N/A	1.00 P/U
5	83.00	5.00(A)	2.00	2.00	25.00	=	N/A	1.00 P/U
6	75.75	-0.00(P)	8.00	10.00	52.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
A trapezoidal surcharge is defined by two values:
N = at edge near to wall, F = at edge far from wall
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 84.00
2	Apply surcharge no.2 at elevation 84.00
3	Apply surcharge no.3 at elevation 84.00
4	Apply surcharge no.4 at elevation 84.00
5	Apply surcharge no.5 at elevation 83.00
6	Install strut or anchor no.1 at elevation 84.40
7	Apply water pressure profile no.1 (Mod. Conserv.) No analysis at this stage
8	Excavate to elevation 80.60 on PASSIVE side
9	Install strut or anchor no.2 at elevation 81.10
10	Apply water pressure profile no.3 (Mod. Conserv.)
11	Excavate to elevation 77.50 on PASSIVE side
12	Install strut or anchor no.3 at elevation 78.00
13	Apply water pressure profile no.5 (Mod. Conserv.)
14	Excavate to elevation 75.75 on PASSIVE side
15	Install strut or anchor no.4 at elevation 76.00
16	Apply surcharge no.6 at elevation 75.75
17	Install strut or anchor no.5 at elevation 79.50
18	Remove strut or anchor no.3 at elevation 78.00
19	Install strut or anchor no.6 at elevation 78.95
20	Remove strut or anchor no.5 at elevation 79.50
21	Install strut or anchor no.7 at elevation 81.75
22	Remove strut or anchor no.2 at elevation 81.10
23	Install strut or anchor no.8 at elevation 83.85
24	Remove strut or anchor no.1 at elevation 84.40
25	Install strut or anchor no.9 at elevation 84.45
26	Remove strut or anchor no.8 at elevation 83.85
27	Change EI of wall to 46970 kN.m2/m run Yield moment not defined No adjustments to wall displacements
28	Change properties of soil type 1 to soil type 4 Ko pressures will be reset
29	Change properties of soil type 2 to soil type 5 Ko pressures will be reset
30	Change properties of soil type 3 to soil type 6 Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 1
Water pressures : Moderately Conservative
Partial factor on C' = 1.000
Partial factor on Phi' = 1.000
Partial factor on Cu = 1.000
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.100
Design factor on calculated Bending Moments = 1.350

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 84.00	No	No	No
2	Apply surcharge no.2 at elev. 84.00	No	No	No
3	Apply surcharge no.3 at elev. 84.00	No	No	No
4	Apply surcharge no.4 at elev. 84.00	No	No	No
5	Apply surcharge no.5 at elev. 83.00	No	No	No
6	Install strut no.1 at elev. 84.40	No	No	No
7	Apply water pressure profile no.1	No	No	No
8	Excav. to elev. 80.60 on PASSIVE side	Yes	No	No
9	Install strut no.2 at elev. 81.10	No	No	No
10	Apply water pressure profile no.3	No	No	No
11	Excav. to elev. 77.50 on PASSIVE side	Yes	No	No
12	Install strut no.3 at elev. 78.00	No	No	No
13	Apply water pressure profile no.5	No	No	No
14	Excav. to elev. 75.75 on PASSIVE side	Yes	No	No
15	Install strut no.4 at elev. 76.00	No	No	No
16	Apply surcharge no.6 at elev. 75.75	No	No	No
17	Install strut no.5 at elev. 79.50	No	No	No
18	Remove strut no.3 at elev. 78.00	No	No	No
19	Install strut no.6 at elev. 78.95	No	No	No
20	Remove strut no.5 at elev. 79.50	No	No	No
21	Install strut no.7 at elev. 81.75	No	No	No
22	Remove strut no.2 at elev. 81.10	No	No	No
23	Install strut no.8 at elev. 83.85	No	No	No
24	Remove strut no.1 at elev. 84.40	Yes	No	No
25	Install strut no.9 at elev. 84.45	No	No	No
26	Remove strut no.8 at elev. 83.85	No	No	No
27	Change EI of wall to 46970kN.m2/m run	No	No	No
28	Change soil type 1 to soil type 4	No	No	No
29	Change soil type 2 to soil type 5	No	No	No
30	Change soil type 3 to soil type 6	Yes	No	No
*	Summary output	Yes	-	Yes

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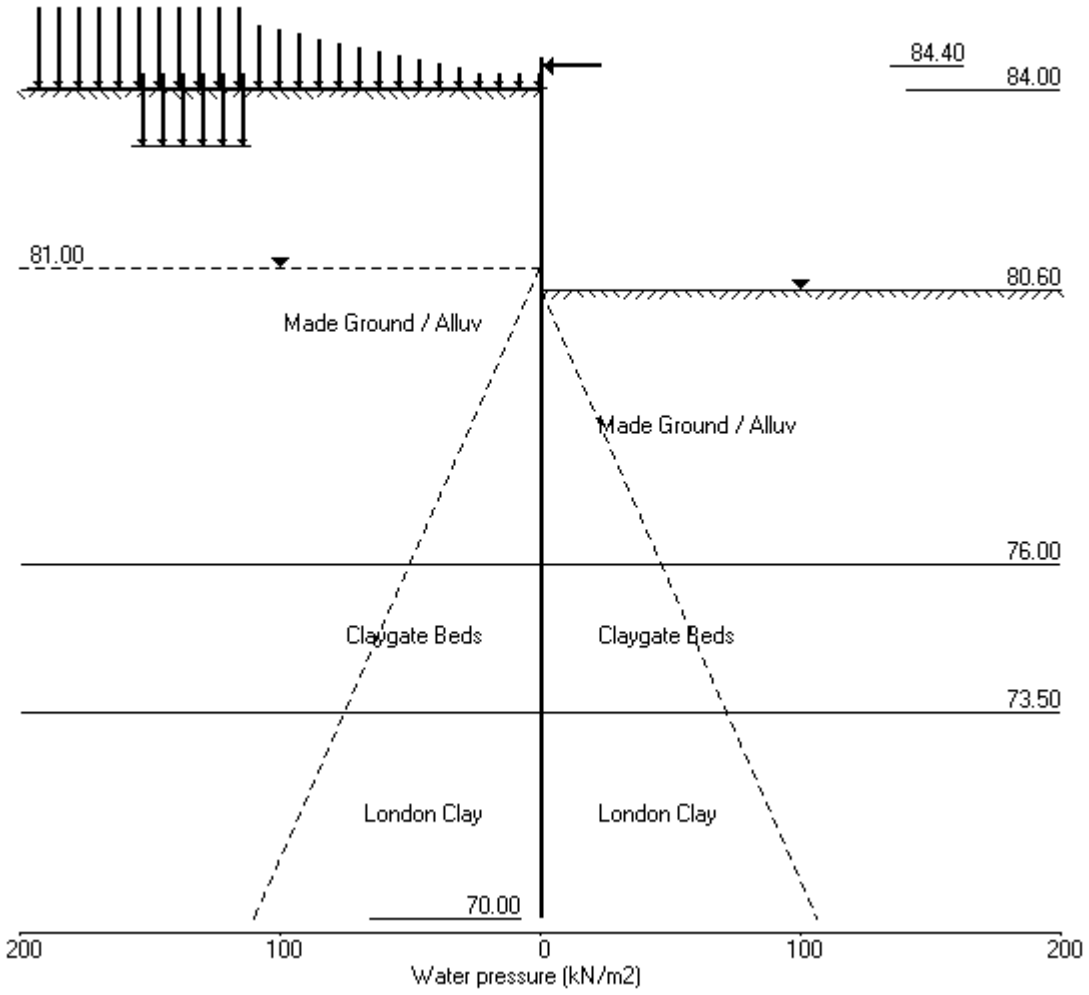
Units: kN,m

Stage No.8 Excav. to elev. 80.60 on PASSIVE side



Units: kN,m

Stage No. 8 Excavate to elevation 80.60 on PASSIVE side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-2.25E-03	0.0	0.0		93940
2	84.40	0.00	0.001	-2.25E-03	0.0	-0.0	23.6	93940
		0.00	0.001	-2.25E-03	-23.6	-0.0		
3	84.00	0.00	0.002	-2.23E-03	-23.6	-9.4		93940
4	83.85	0.75	0.002	-2.21E-03	-23.5	-13.0		93940
5	83.43	2.87	0.003	-2.13E-03	-22.7	-22.8		93940
6	83.00	5.00	0.004	-2.00E-03	-21.1	-32.1		93940
7	82.38	8.13	0.005	-1.75E-03	-17.0	-44.1		93940
8	81.75	11.25	0.006	-1.43E-03	-10.9	-52.9		93940
9	81.10	14.50	0.007	-1.05E-03	-2.5	-57.4		93940
10	81.00	15.00	0.007	-9.89E-04	-1.1	-57.6		93940
11	80.60	17.00	0.007	-7.46E-04	5.3	-56.7		93940
		-6.12	0.007	-7.46E-04	5.3	-56.7		
12	80.05	-5.72	0.008	-4.23E-04	2.1	-53.5		93940
13	79.50	-1.85	0.008	-1.11E-04	-0.0	-53.0		93940
14	78.95	3.06	0.008	1.99E-04	0.3	-53.1		93940
15	78.47	8.13	0.008	4.65E-04	3.0	-52.4		93940
16	78.00	13.98	0.007	7.24E-04	8.2	-49.9		93940
17	77.50	17.38	0.007	9.74E-04	16.1	-44.1		93940
18	76.75	22.64	0.006	1.25E-03	31.1	-27.2		93940
19	76.00	28.70	0.005	1.35E-03	50.3	2.4		93940
		-45.90	0.005	1.35E-03	50.3	2.4		
20	75.75	-41.17	0.005	1.33E-03	39.4	13.5		93940
21	75.08	-28.35	0.004	1.17E-03	16.0	30.7		93940
22	74.40	-17.01	0.003	9.41E-04	0.7	35.0		93940
23	73.95	-10.84	0.003	7.77E-04	-5.6	33.5		93940
24	73.50	-5.93	0.003	6.26E-04	-9.4	29.9		93940
25	72.75	-0.01	0.002	4.22E-04	-11.6	21.0		93940
26	72.00	3.25	0.002	2.90E-04	-10.4	12.2		93940
27	71.20	5.01	0.002	2.18E-04	-7.1	4.7		93940
28	70.60	5.89	0.002	1.99E-04	-3.8	1.3		93940
29	70.00	6.80	0.001	1.95E-04	-0.0	-0.0		---

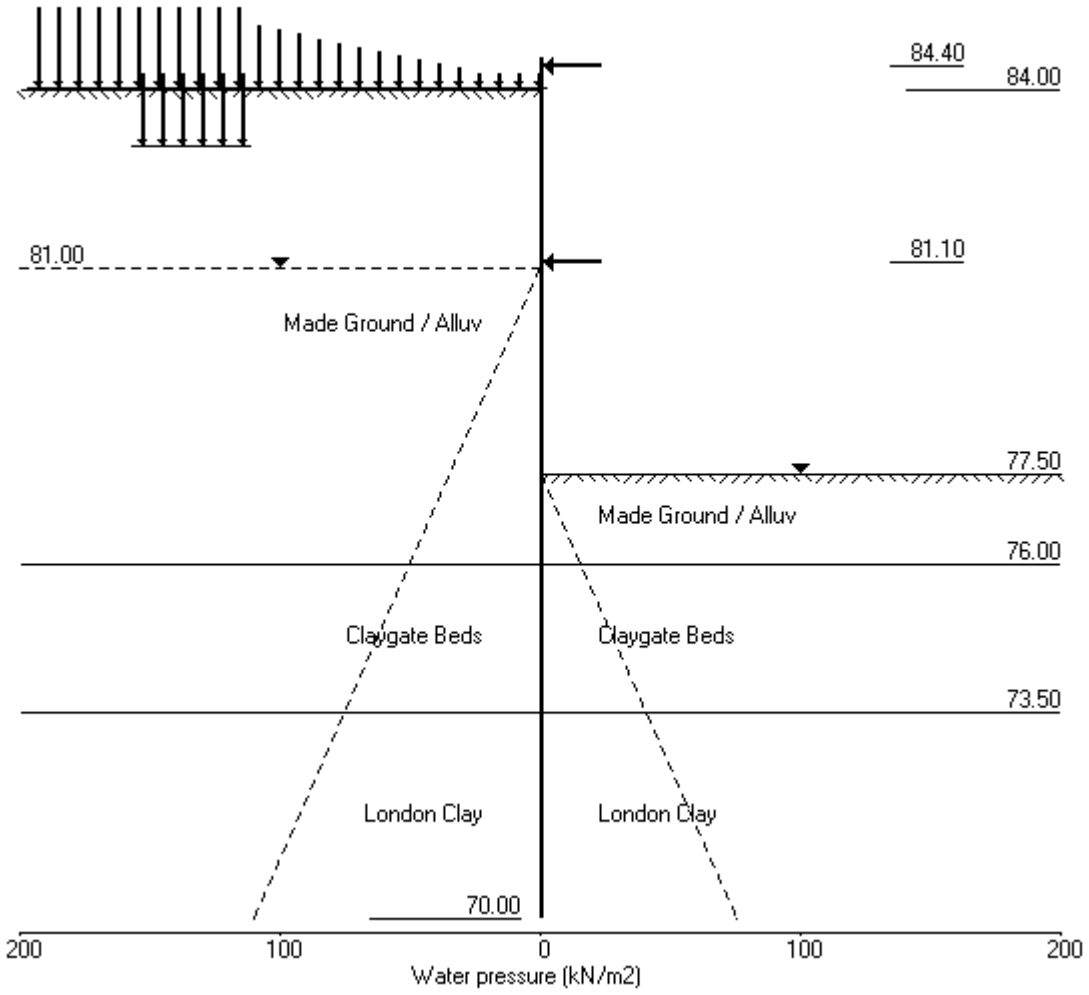
At elev. 84.40 Strut force = 70.7 kN/strut = 23.6 kN/m run

(continued)

Stage No.8 Excavate to elevation 80.60 on PASSIVE side

Units: kN,m

Stage No.11 Excav. to elev. 77.50 on PASSIVE side



Units: kN,m

Stage No. 11 Excavate to elevation 77.50 on PASSIVE side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-1.92E-03	0.0	0.0		93940
2	84.40	0.00	0.001	-1.92E-03	0.0	-0.0	1.7	93940
		0.00	0.001	-1.92E-03	-1.7	-0.0		
3	84.00	0.00	0.002	-1.92E-03	-1.7	-0.7		93940
		1.12	0.002	-1.92E-03	-1.7	-0.7		
4	83.85	2.13	0.002	-1.92E-03	-1.5	-0.9		93940
5	83.43	4.88	0.003	-1.91E-03	-0.0	-1.3		93940
6	83.00	7.40	0.004	-1.91E-03	2.6	-0.8		93940
7	82.38	10.43	0.005	-1.91E-03	8.2	2.5		93940
8	81.75	12.34	0.006	-1.95E-03	15.3	9.9		93940
9	81.10	14.50	0.007	-2.07E-03	24.0	22.7	102.9	93940
		14.50	0.007	-2.07E-03	-78.9	22.7		
10	81.00	15.00	0.007	-2.09E-03	-77.4	14.9		93940
11	80.60	17.00	0.008	-2.09E-03	-71.0	-14.8		93940
12	80.05	19.75	0.009	-1.90E-03	-60.9	-50.0		93940
13	79.50	22.50	0.010	-1.52E-03	-49.3	-80.3		93940
14	78.95	30.84	0.011	-9.82E-04	-34.6	-103.6		93940
15	78.47	38.96	0.011	-4.27E-04	-18.0	-116.3		93940
16	78.00	47.03	0.011	1.70E-04	2.4	-120.2		93940
17	77.50	55.48	0.011	7.91E-04	28.0	-112.9		93940
		38.13	0.011	7.91E-04	28.0	-112.9		
18	76.75	47.23	0.010	1.56E-03	60.0	-80.9		93940
19	76.00	57.53	0.009	1.97E-03	99.3	-22.4		93940
		-79.79	0.009	1.97E-03	99.3	-22.4		
20	75.75	-72.85	0.008	2.00E-03	80.2	-0.1		93940
21	75.08	-52.58	0.007	1.87E-03	37.9	37.4		93940
22	74.40	-33.38	0.006	1.55E-03	8.9	51.0		93940
23	73.95	-22.48	0.005	1.30E-03	-3.7	51.6		93940
24	73.50	-13.56	0.005	1.07E-03	-11.8	47.6		93940
25	72.75	-2.32	0.004	7.42E-04	-17.7	34.8		93940
26	72.00	4.26	0.004	5.21E-04	-17.0	20.7		93940
27	71.20	8.10	0.003	3.98E-04	-12.1	8.2		93940
28	70.60	10.07	0.003	3.64E-04	-6.6	2.3		93940
29	70.00	12.00	0.003	3.57E-04	0.0	-0.0		---

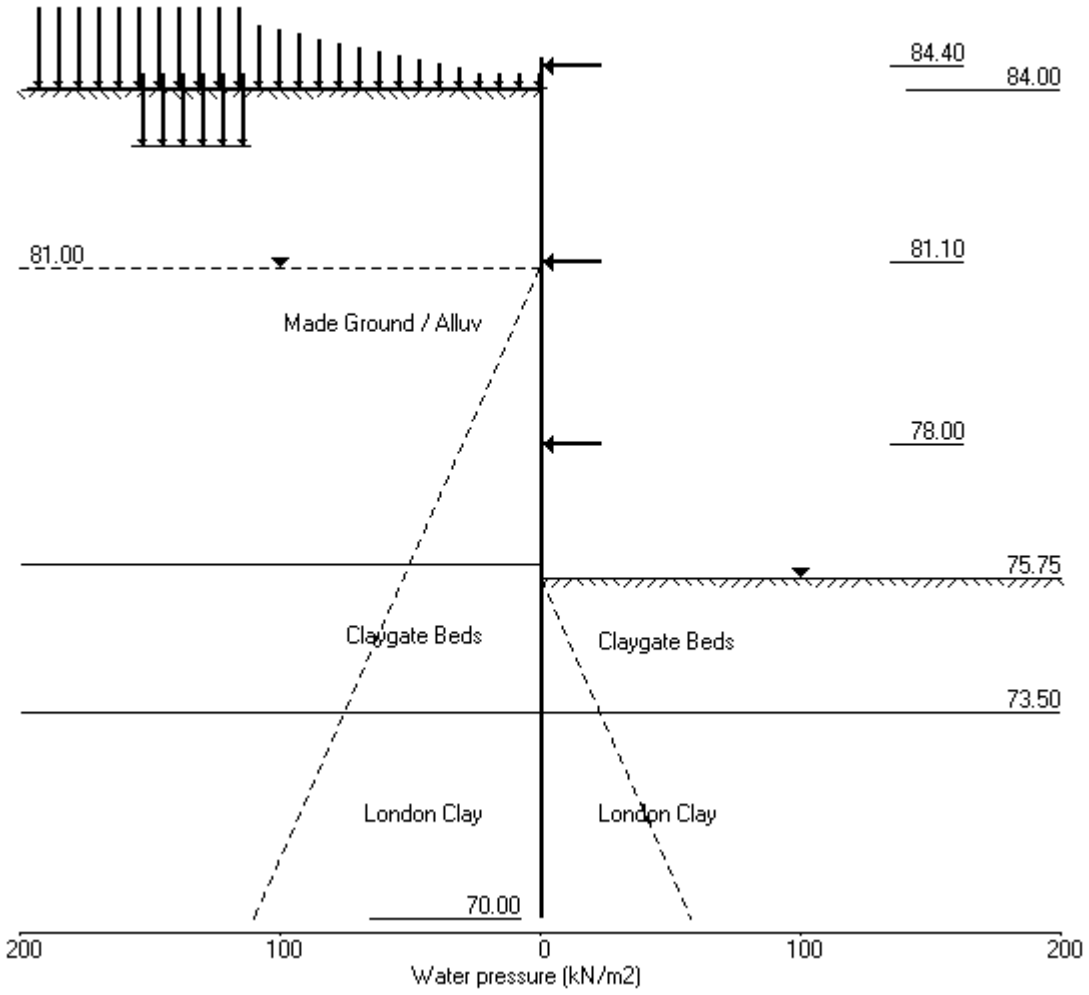
At elev. 84.40 Strut force = 5.2 kN/strut = 1.7 kN/m run
At elev. 81.10 Strut force = 308.6 kN/strut = 102.9 kN/m run

(continued)

Stage No.11 Excavate to elevation 77.50 on PASSIVE side

Units: kN,m

Stage No.14 Excav. to elev. 75.75 on PASSIVE side



Units: kN,m

Stage No. 14 Excavate to elevation 75.75 on PASSIVE side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-1.92E-03	0.0	0.0		93940
2	84.40	0.00	0.001	-1.92E-03	0.0	-0.0	2.3	93940
		0.00	0.001	-1.92E-03	-2.3	-0.0		
3	84.00	0.00	0.002	-1.92E-03	-2.3	-0.9		93940
		1.09	0.002	-1.92E-03	-2.3	-0.9		
4	83.85	2.10	0.002	-1.92E-03	-2.1	-1.3		93940
5	83.43	4.86	0.003	-1.91E-03	-0.6	-1.9		93940
6	83.00	7.39	0.004	-1.90E-03	2.0	-1.7		93940
7	82.38	10.46	0.005	-1.90E-03	7.6	1.3		93940
8	81.75	12.44	0.006	-1.93E-03	14.7	8.2		93940
9	81.10	14.71	0.007	-2.03E-03	23.5	20.7	91.9	93940
		14.71	0.007	-2.03E-03	-68.3	20.7		
10	81.00	15.23	0.007	-2.05E-03	-66.8	13.9		93940
11	80.60	17.32	0.008	-2.06E-03	-60.3	-11.5		93940
12	80.05	20.13	0.009	-1.90E-03	-50.0	-40.8		93940
13	79.50	22.74	0.010	-1.59E-03	-38.2	-65.1		93940
14	78.95	30.84	0.011	-1.16E-03	-23.5	-82.3		93940
15	78.47	38.96	0.012	-7.32E-04	-6.9	-89.7		93940
16	78.00	47.03	0.012	-2.82E-04	13.5	-88.3	54.4	93940
		47.03	0.012	-2.82E-04	-40.9	-88.3		
17	77.50	55.48	0.012	2.25E-04	-15.3	-102.7		93940
18	76.75	68.08	0.011	1.02E-03	31.0	-98.0		93940
19	76.00	80.62	0.010	1.63E-03	86.8	-55.2		93940
		40.00	0.010	1.63E-03	86.8	-55.2		
20	75.75	45.51	0.010	1.75E-03	97.5	-32.1		93940
		-73.95	0.010	1.75E-03	97.5	-32.1		
21	75.08	-57.29	0.009	1.80E-03	53.2	16.8		93940
22	74.40	-39.36	0.008	1.60E-03	20.6	39.6		93940
23	73.95	-28.44	0.007	1.40E-03	5.3	44.9		93940
24	73.50	-19.05	0.006	1.19E-03	-5.4	44.4		93940
25	72.75	-6.30	0.005	8.73E-04	-14.9	34.9		93940
26	72.00	1.96	0.005	6.47E-04	-16.5	21.8		93940
27	71.20	7.49	0.004	5.16E-04	-12.7	9.0		93940
28	70.60	10.64	0.004	4.79E-04	-7.3	2.6		93940
29	70.00	13.70	0.004	4.71E-04	0.0	-0.0		---

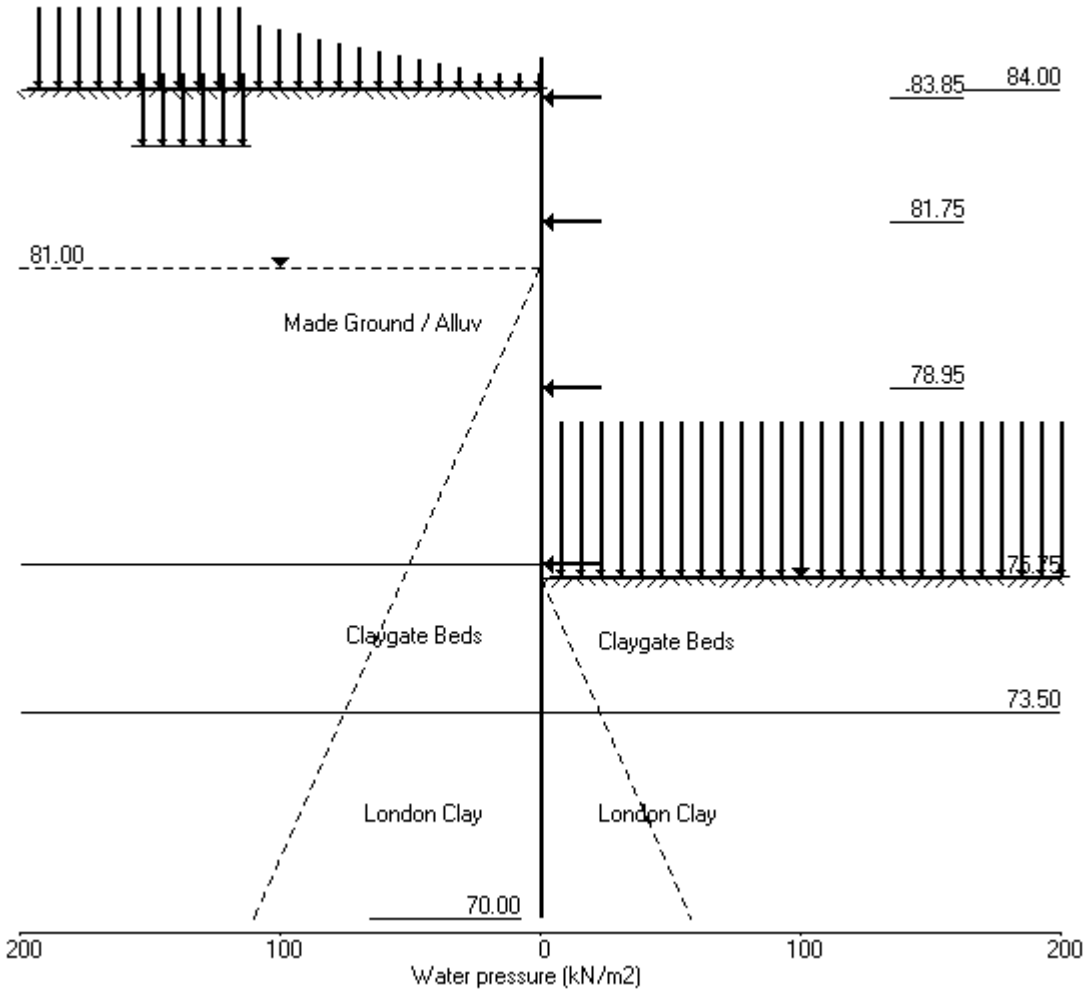
At elev. 84.40 Strut force = 7.0 kN/strut = 2.3 kN/m run
At elev. 81.10 Strut force = 275.6 kN/strut = 91.9 kN/m run
At elev. 78.00 Strut force = 163.3 kN/strut = 54.4 kN/m run

(continued)

Stage No.14 Excavate to elevation 75.75 on PASSIVE side

Units: kN,m

Stage No.24 Remove strut no.1 at elev. 84.40



Units: kN,m

Stage No. 24 Remove strut or anchor no.1 at elevation 84.40

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.000	-2.08E-03	0.0	0.0		93940
2	84.40	0.00	0.000	-2.08E-03	0.0	-0.0		93940
3	84.00	0.00	0.001	-2.08E-03	0.0	-0.0		93940
		4.86	0.001	-2.08E-03	0.0	-0.0		
4	83.85	5.67	0.001	-2.08E-03	0.8	0.1	-0.0	93940
5	83.43	7.85	0.002	-2.08E-03	3.7	1.0		93940
6	83.00	9.75	0.003	-2.09E-03	7.4	3.3		93940
7	82.38	11.75	0.005	-2.14E-03	14.1	10.1		93940
8	81.75	12.40	0.006	-2.24E-03	21.7	21.4	80.8	93940
		12.40	0.006	-2.24E-03	-59.1	21.4		
9	81.10	14.50	0.007	-2.27E-03	-50.4	-14.2		93940
10	81.00	15.00	0.008	-2.25E-03	-48.9	-19.1		93940
11	80.60	17.00	0.009	-2.13E-03	-42.5	-37.4		93940
12	80.05	19.75	0.010	-1.85E-03	-32.4	-57.0		93940
13	79.50	22.50	0.011	-1.48E-03	-20.8	-71.6		93940
14	78.95	30.84	0.011	-1.03E-03	-6.1	-79.2	53.9	93940
		30.84	0.011	-1.03E-03	-60.0	-79.2		
15	78.47	39.28	0.012	-5.76E-04	-43.3	-104.0		93940
16	78.00	47.57	0.012	-1.02E-05	-22.7	-119.9		93940
17	77.50	56.12	0.012	6.42E-04	3.2	-125.2		93940
18	76.75	69.89	0.011	1.56E-03	50.5	-106.3		93940
19	76.00	83.92	0.009	2.18E-03	108.1	-48.4	-0.0	93940
		49.92	0.009	2.18E-03	108.1	-48.4		
20	75.75	57.12	0.009	2.27E-03	121.5	-19.7		93940
		-101.99	0.009	2.27E-03	121.5	-19.7		
21	75.08	-76.08	0.007	2.20E-03	61.4	39.1		93940
22	74.40	-50.19	0.006	1.83E-03	18.8	63.3		93940
23	73.95	-34.90	0.005	1.52E-03	-0.3	66.6		93940
24	73.50	-21.94	0.005	1.21E-03	-13.1	63.0		93940
25	72.75	-5.35	0.004	7.75E-04	-23.4	47.1		93940
26	72.00	4.97	0.003	4.74E-04	-23.5	28.2		93940
27	71.20	11.26	0.003	3.06E-04	-17.0	11.2		93940
28	70.60	14.31	0.003	2.61E-04	-9.3	3.0		93940
29	70.00	16.86	0.003	2.51E-04	0.0	-0.0		---

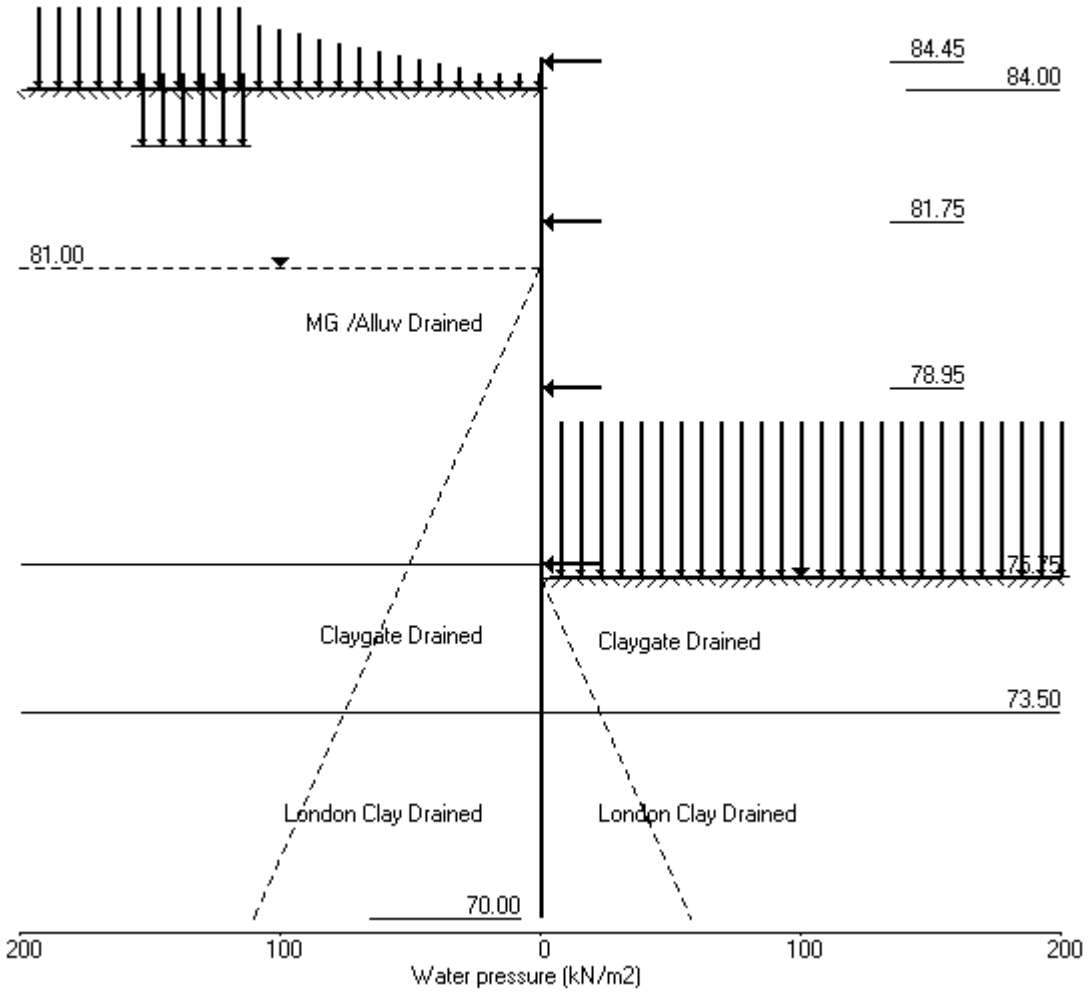
At elev. 83.85 The strut is slack
At elev. 81.75 Strut force = 80.8 kN/strut = 80.8 kN/m run
At elev. 78.95 Strut force = 53.9 kN/strut = 53.9 kN/m run
At elev. 76.00 The strut is slack

(continued)

Stage No.24 Remove strut or anchor no.1 at elevation 84.40

Units: kN,m

Stage No.30 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 30 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.000	-2.13E-03	0.0	0.0	-0.0	46970
2	84.40	0.00	0.000	-2.13E-03	0.0	-0.0		46970
3	84.00	0.00	0.001	-2.13E-03	0.0	-0.0		46970
		5.41	0.001	-2.13E-03	0.0	-0.0		
4	83.85	6.13	0.001	-2.13E-03	0.9	0.1		46970
5	83.43	8.23	0.002	-2.13E-03	3.9	1.1		46970
6	83.00	11.79	0.003	-2.14E-03	8.2	3.6		46970
7	82.38	17.35	0.005	-2.20E-03	17.3	11.5		46970
8	81.75	22.86	0.006	-2.35E-03	29.8	26.2	107.9	46970
		22.86	0.006	-2.35E-03	-78.0	26.2		
9	81.10	28.53	0.008	-2.37E-03	-61.3	-19.2		46970
10	81.00	29.39	0.008	-2.34E-03	-58.5	-25.2		46970
11	80.60	34.88	0.009	-2.16E-03	-45.6	-46.1		46970
12	80.05	42.50	0.010	-1.79E-03	-24.3	-64.3		46970
13	79.50	50.15	0.011	-1.37E-03	1.2	-70.8		46970
14	78.95	57.79	0.011	-1.03E-03	30.8	-62.2	116.2	46970
		57.79	0.011	-1.03E-03	-85.4	-62.2		
15	78.47	64.23	0.012	-7.02E-04	-56.4	-96.1		46970
16	78.00	70.52	0.012	-1.98E-04	-24.4	-115.5		46970
17	77.50	76.97	0.012	3.95E-04	12.5	-118.8		46970
18	76.75	86.46	0.011	1.11E-03	73.8	-87.4		46970
19	76.00	95.28	0.010	1.25E-03	141.9	-7.7	129.2	46970
		141.23	0.010	1.25E-03	12.7	-7.7		
20	75.75	143.68	0.010	1.19E-03	48.3	-0.0		46970
		-31.66	0.010	1.19E-03	48.3	-0.0		
21	75.08	-26.64	0.009	1.08E-03	28.6	24.3		46970
22	74.40	-20.89	0.009	1.01E-03	12.6	36.5		46970
23	73.95	-16.71	0.008	9.62E-04	4.2	39.8		46970
24	73.50	-12.46	0.008	8.91E-04	-2.4	39.8		46970
		-14.61	0.008	8.91E-04	-2.4	39.8		
25	72.75	-7.04	0.007	7.52E-04	-10.5	32.7		46970
26	72.00	-0.63	0.007	6.17E-04	-13.4	21.9		46970
27	71.20	4.57	0.006	5.11E-04	-11.8	10.3		46970
28	70.60	8.44	0.006	4.65E-04	-7.9	3.8		46970
29	70.00	18.00	0.006	4.51E-04	0.0	-0.0		---

At elev. 84.45 The strut is slack
At elev. 81.75 Strut force = 107.9 kN/strut = 107.9 kN/m run
At elev. 78.95 Strut force = 116.2 kN/strut = 116.2 kN/m run
At elev. 76.00 Strut force = 129.2 kN/strut = 129.2 kN/m run

(continued)

Stage No.30 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment Calculated		Bending moment Factored		Shear force Calculated		Shear force Factored	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
		m	m	kN.m/m		kN.m/m		kN/m	kN/m	kN/m	kN/m
1	84.45	0.001	0.000	0	0	0	0	0	0	0	0
2	84.40	0.001	0.000	0	-0	0	-0	0	-24	0	-32
3	84.00	0.002	0.000	0	-9	0	-13	0	-24	0	-32
4	83.85	0.002	0.000	0	-13	0	-17	1	-24	1	-32
5	83.43	0.003	0.000	1	-23	1	-31	4	-23	5	-31
6	83.00	0.004	0.000	4	-32	5	-43	8	-21	11	-28
7	82.38	0.005	0.000	11	-44	15	-60	17	-17	23	-23
8	81.75	0.006	0.000	26	-53	35	-71	30	-78	40	-105
9	81.10	0.008	0.000	25	-57	34	-77	25	-79	34	-106
10	81.00	0.008	0.000	18	-58	24	-78	0	-77	0	-104
11	80.60	0.009	0.000	0	-57	0	-77	5	-71	7	-96
12	80.05	0.010	0.000	0	-64	0	-87	2	-61	3	-82
13	79.50	0.011	0.000	0	-80	0	-108	4	-69	6	-93
14	78.95	0.011	0.000	0	-104	0	-140	34	-103	46	-140
15	78.47	0.012	0.000	0	-117	0	-158	3	-74	4	-100
16	78.00	0.012	0.000	0	-130	0	-176	14	-43	18	-58
17	77.50	0.012	0.000	0	-138	0	-186	28	-15	38	-21
18	76.75	0.011	0.000	0	-120	0	-163	74	0	100	0
19	76.00	0.010	0.000	2	-55	3	-74	142	0	192	0
20	75.75	0.010	0.000	14	-32	18	-43	136	0	183	0
21	75.08	0.009	0.000	42	0	57	0	67	0	90	0
22	74.40	0.009	0.000	68	0	92	0	27	-0	37	-0
23	73.95	0.008	0.000	71	0	96	0	26	-6	35	-8
24	73.50	0.008	0.000	66	0	90	0	30	-15	41	-20
25	72.75	0.007	0.000	55	0	75	0	0	-25	0	-34
26	72.00	0.007	0.000	41	0	55	0	0	-25	0	-33
27	71.20	0.006	0.000	20	0	27	0	0	-24	0	-32
28	70.60	0.006	0.000	7	0	9	0	0	-16	0	-22
29	70.00	0.006	0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment						Shear force					
	Calculated				Factored		Calculated				Factored	
no.	max.	elev.	min.	elev.	max.	min.	max.	elev.	min.	elev.	max.	min.
	kN.m/m		kN.m/m		kN.m/m		kN/m		kN/m		kN/m	kN/m
1	2	75.08	-1	79.50	3	-1	2	76.00	-1	72.75	3	-1
2	3	74.40	-2	78.95	4	-2	3	76.00	-1	72.75	4	-1
3	4	74.40	-4	78.95	6	-6	5	76.00	-1	81.75	6	-2
4	5	74.40	-6	78.47	7	-8	6	76.00	-2	81.10	9	-2
5	5	74.40	-6	78.47	7	-9	7	76.00	-2	81.10	9	-3
6	No calculation at this stage											
7	No calculation at this stage											
8	35	74.40	-58	81.00	47	-78	50	76.00	-24	84.40	68	-32
9	No calculation at this stage											
10	35	74.40	-57	81.00	47	-77	50	76.00	-24	84.40	67	-32
11	52	73.95	-120	78.00	70	-162	99	76.00	-79	81.10	134	-106
12	No calculation at this stage											
13	51	73.95	-120	78.00	69	-162	99	76.00	-79	81.10	134	-106
14	45	73.95	-103	77.50	61	-139	97	75.75	-68	81.10	132	-92
15	No calculation at this stage											
16	65	73.95	-120	77.50	88	-162	119	75.75	-77	81.10	160	-104
17	No calculation at this stage											
18	68	73.95	-133	77.50	92	-179	125	75.75	-69	79.50	169	-93
19	No calculation at this stage											
20	68	73.95	-131	77.50	92	-177	124	75.75	-74	81.10	168	-100
21	No calculation at this stage											
22	67	73.95	-125	77.50	90	-169	122	75.75	-60	78.95	164	-81
23	No calculation at this stage											
24	67	73.95	-125	77.50	90	-169	122	75.75	-60	78.95	164	-81
25	No calculation at this stage											
26	67	73.95	-125	77.50	90	-169	122	75.75	-60	78.95	164	-81
27	No calculation at this stage											
28	71	73.95	-138	77.50	96	-186	136	75.75	-103	78.95	183	-140
29	55	72.75	-126	77.50	75	-170	133	76.00	-94	78.95	179	-126
30	40	73.95	-119	77.50	54	-160	142	76.00	-85	78.95	192	-115

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	elev.	minimum m	elev.	Stage description
1	0.001	84.45	0.000	84.45	Apply surcharge no.1 at elev. 84.00
2	0.001	84.45	0.000	84.45	Apply surcharge no.2 at elev. 84.00
3	0.001	81.10	0.000	84.45	Apply surcharge no.3 at elev. 84.00
4	0.001	80.05	0.000	84.45	Apply surcharge no.4 at elev. 84.00
5	0.001	80.05	0.000	84.45	Apply surcharge no.5 at elev. 83.00
6	No calculation at this stage				Install strut no.1 at elev. 84.40
7	No calculation at this stage				Apply water pressure profile no.1
8	0.008	79.50	0.000	84.45	Excav. to elev. 80.60 on PASSIVE side
9	No calculation at this stage				Install strut no.2 at elev. 81.10
10	0.008	79.50	0.000	84.45	Apply water pressure profile no.3
11	0.011	78.00	0.000	84.45	Excav. to elev. 77.50 on PASSIVE side
12	No calculation at this stage				Install strut no.3 at elev. 78.00
13	0.011	78.00	0.000	84.45	Apply water pressure profile no.5
14	0.012	77.50	0.000	84.45	Excav. to elev. 75.75 on PASSIVE side
15	No calculation at this stage				Install strut no.4 at elev. 76.00
16	0.012	78.00	0.000	84.45	Apply surcharge no.6 at elev. 75.75
17	No calculation at this stage				Install strut no.5 at elev. 79.50
18	0.012	78.00	0.000	84.45	Remove strut no.3 at elev. 78.00
19	No calculation at this stage				Install strut no.6 at elev. 78.95
20	0.012	78.00	0.000	84.45	Remove strut no.5 at elev. 79.50
21	No calculation at this stage				Install strut no.7 at elev. 81.75
22	0.012	78.00	0.000	84.45	Remove strut no.2 at elev. 81.10
23	No calculation at this stage				Install strut no.8 at elev. 83.85
24	0.012	78.00	0.000	84.45	Remove strut no.1 at elev. 84.40
25	No calculation at this stage				Install strut no.9 at elev. 84.45
26	0.012	78.00	0.000	84.45	Remove strut no.8 at elev. 83.85
27	No calculation at this stage				Change EI of wall to 46970kN.m2/m run
28	0.012	78.00	0.000	84.45	Change soil type 1 to soil type 4
29	0.012	77.50	0.000	84.45	Change soil type 2 to soil type 5
30	0.012	78.00	0.000	84.45	Change soil type 3 to soil type 6

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev. 84.40			Strut no. 2 at elev. 81.10			Strut no. 3 at elev. 78.00		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
8	24	71	95	---	---	---	---	---	---
10	24	71	95	slack	slack	slack	---	---	---
11	2	5	7	103	309	417	---	---	---
13	2	5	7	103	308	416	0	1	2
14	2	7	10	92	276	372	54	163	221
16	1	4	6	101	303	410	31	94	127
18	2	5	7	92	275	371	---	---	---
20	1	3	5	99	296	400	---	---	---
22	slack	slack	slack	---	---	---	---	---	---

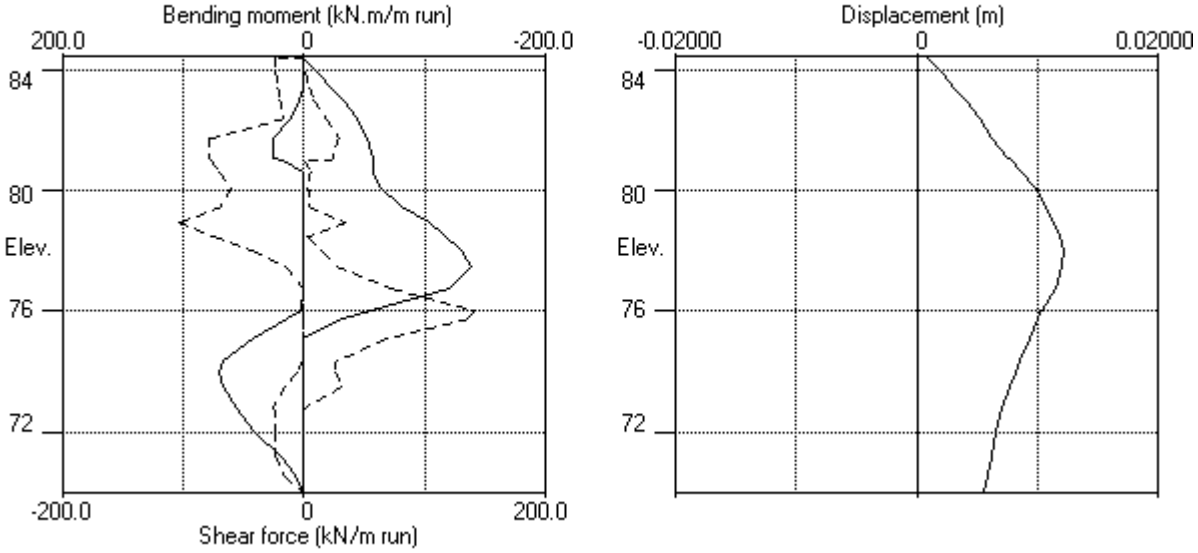
Stage no.	Strut no. 4 at elev. 76.00			Strut no. 5 at elev. 79.50			Strut no. 6 at elev. 78.95		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
16	slack	slack	slack	---	---	---	---	---	---
18	slack	slack	slack	32	96	129	---	---	---
20	slack	slack	slack	---	---	---	26	26	36
22	slack	slack	slack	---	---	---	54	54	73
24	slack	slack	slack	---	---	---	54	54	73
26	slack	slack	slack	---	---	---	54	54	73
28	slack	slack	slack	---	---	---	137	137	185
29	115	115	155	---	---	---	127	127	171
30	129	129	174	---	---	---	116	116	157

Stage no.	Strut no. 7 at elev. 81.75			Strut no. 8 at elev. 83.85			Strut no. 9 at elev. 84.45		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
22	81	81	109	---	---	---	---	---	---
24	81	81	109	slack	slack	slack	---	---	---
26	81	81	109	---	---	---	slack	slack	slack
28	105	105	141	---	---	---	slack	slack	slack
29	106	106	143	---	---	---	slack	slack	slack
30	108	108	146	---	---	---	slack	slack	slack

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	84.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES (Unfactored SLS soil strengths)

No.	Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type ------- Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	80.10	80.10	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	77.00	77.00	0.0	WC
5	1	81.00	81.00	0.0	1	75.75	75.75	0.0	MC
6	1	82.00	82.00	0.0	1	75.25	75.25	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 70.00
Maximum finite element length = 0.80 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	2.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	76.00	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.100000	2.000E+08	4.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	83.85	1.00	0.100000	2.000E+08	4.00	0.00	0	No
9	84.45	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	84.00	0.00(A)	8.00	20.00	5.00	=	N/A	1.30 Var
2	84.00	5.00(A)	8.00	15.00	5.00	=	N/A	1.30 Var
3	84.00	1.00(A)	8.00	4.00	0.00	17.00	N/A	1.00 P/U
4	84.00	5.00(A)	8.00	10.00	17.00	=	N/A	1.00 P/U
5	83.00	5.00(A)	2.00	2.00	25.00	=	N/A	1.00 P/U
6	75.75	-0.00(P)	8.00	10.00	52.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
A trapezoidal surcharge is defined by two values:
N = at edge near to wall, F = at edge far from wall
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 84.00
2	Apply surcharge no.2 at elevation 84.00
3	Apply surcharge no.3 at elevation 84.00
4	Apply surcharge no.4 at elevation 84.00
5	Apply surcharge no.5 at elevation 83.00
6	Install strut or anchor no.1 at elevation 84.40
7	Apply water pressure profile no.2 (Worst Cred.) No analysis at this stage
8	Excavate to elevation 80.60 on PASSIVE side
9	Install strut or anchor no.2 at elevation 81.10
10	Apply water pressure profile no.4 (Worst Cred.)
11	Excavate to elevation 77.50 on PASSIVE side
12	Install strut or anchor no.3 at elevation 78.00
13	Apply water pressure profile no.6 (Worst Cred.)
14	Excavate to elevation 75.75 on PASSIVE side
15	Install strut or anchor no.4 at elevation 76.00
16	Apply surcharge no.6 at elevation 75.75
17	Install strut or anchor no.5 at elevation 79.50
18	Remove strut or anchor no.3 at elevation 78.00
19	Install strut or anchor no.6 at elevation 78.95
20	Remove strut or anchor no.5 at elevation 79.50
21	Install strut or anchor no.7 at elevation 81.75
22	Remove strut or anchor no.2 at elevation 81.10
23	Install strut or anchor no.8 at elevation 83.85
24	Remove strut or anchor no.1 at elevation 84.40
25	Install strut or anchor no.9 at elevation 84.45
26	Remove strut or anchor no.8 at elevation 83.85
27	Change EI of wall to 46970 kN.m2/m run Yield moment not defined No adjustments to wall displacements
28	Change properties of soil type 1 to soil type 4 Ko pressures will be reset
29	Change properties of soil type 2 to soil type 5 Ko pressures will be reset
30	Change properties of soil type 3 to soil type 6 Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 2
- Water pressures : Worst Credible
- Partial factor on C' = 1.250
- Partial factor on Phi' = 1.250
- Partial factor on Cu = 1.400
- Partial factor on Soil Modulus = 1.000
- Partial factor on Permanent Unfavourable loads = 1.000
- Partial factor on Permanent Favourable loads = 1.000
- Partial factor on Permanent Variable loads = 1.300

Stability analysis:
- Method of analysis - Strength Factor method
- Overall factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
- Minimum equivalent fluid density = 5.00 kN/m3
- Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
- Method - Subgrade reaction model using Influence Coefficients
- Open Tension Crack analysis? - No
- Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
- Length of wall (normal to plane of analysis) = 6.00 m
- Width of excavation on active side of wall = 20.00 m
- Width of excavation on passive side of wall = 10.00 m
- Distance to rigid boundary on active side = 20.00 m
- Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom., Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 84.00	No	No	No
2	Apply surcharge no.2 at elev. 84.00	No	No	No
3	Apply surcharge no.3 at elev. 84.00	No	No	No
4	Apply surcharge no.4 at elev. 84.00	No	No	No
5	Apply surcharge no.5 at elev. 83.00	No	No	No
6	Install strut no.1 at elev. 84.40	No	No	No
7	Apply water pressure profile no.2	No	No	No
8	Excav. to elev. 80.60 on PASSIVE side	Yes	No	No
9	Install strut no.2 at elev. 81.10	No	No	No
10	Apply water pressure profile no.4	No	No	No
11	Excav. to elev. 77.50 on PASSIVE side	Yes	No	No
12	Install strut no.3 at elev. 78.00	No	No	No
13	Apply water pressure profile no.6	No	No	No
14	Excav. to elev. 75.75 on PASSIVE side	Yes	No	No
15	Install strut no.4 at elev. 76.00	No	No	No
16	Apply surcharge no.6 at elev. 75.75	No	No	No
17	Install strut no.5 at elev. 79.50	No	No	No
18	Remove strut no.3 at elev. 78.00	No	No	No
19	Install strut no.6 at elev. 78.95	No	No	No
20	Remove strut no.5 at elev. 79.50	No	No	No
21	Install strut no.7 at elev. 81.75	No	No	No
22	Remove strut no.2 at elev. 81.10	No	No	No
23	Install strut no.8 at elev. 83.85	No	No	No
24	Remove strut no.1 at elev. 84.40	Yes	No	No
25	Install strut no.9 at elev. 84.45	No	No	No
26	Remove strut no.8 at elev. 83.85	No	No	No
27	Change EI of wall to 46970kN.m2/m run	No	No	No
28	Change soil type 1 to soil type 4	No	No	No
29	Change soil type 2 to soil type 5	No	No	No
30	Change soil type 3 to soil type 6	Yes	No	No
*	Summary output	Yes	-	Yes

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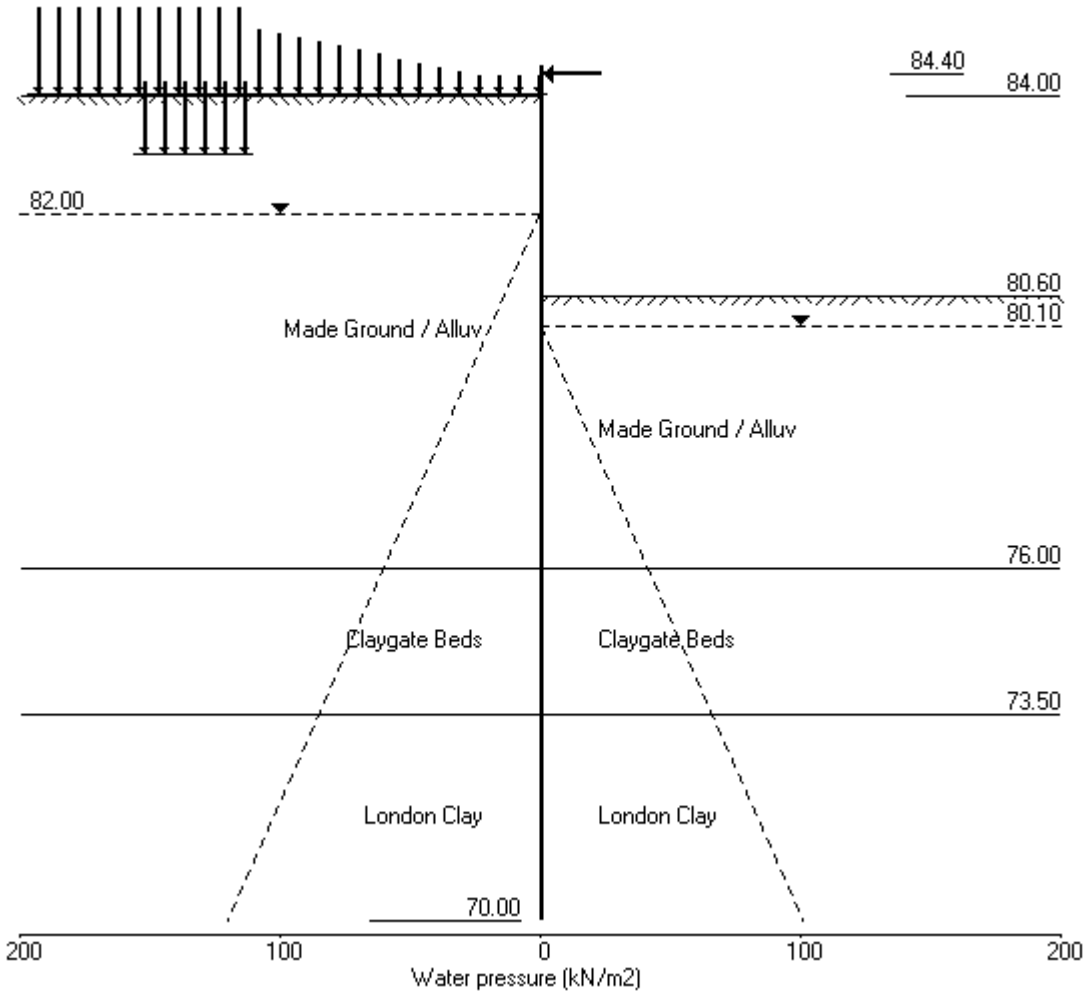
Units: kN,m

Stage No.8 Excav. to elev. 80.60 on PASSIVE side



Units: kN,m

Stage No. 8 Excavate to elevation 80.60 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe FoS = 1.000 Toe elev.	Wall Penetr -ation
8	84.00	80.60	84.40	2.383	n/a	79.82	0.78

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-2.90E-03	0.0	-0.0		93940
2	84.40	0.00	0.001	-2.90E-03	0.0	0.0	28.4	93940
		0.00	0.001	-2.90E-03	-28.4	-0.0		
3	84.00	0.00	0.002	-2.88E-03	-28.4	-11.4		93940
4	83.85	0.75	0.003	-2.86E-03	-28.3	-15.6		93940
5	83.43	2.87	0.004	-2.76E-03	-27.6	-27.5		93940
6	83.00	5.00	0.005	-2.61E-03	-25.9	-38.9		93940
7	82.50	7.50	0.006	-2.37E-03	-22.8	-51.1		93940
8	82.00	10.00	0.007	-2.07E-03	-18.4	-61.5		93940
9	81.75	11.25	0.008	-1.90E-03	-15.7	-65.7		93940
10	81.10	14.50	0.009	-1.42E-03	-7.4	-73.3		93940
11	81.00	15.00	0.009	-1.34E-03	-5.9	-74.0		93940
12	80.60	21.36	0.010	-1.03E-03	1.4	-75.0		93940
		-10.29	0.010	-1.03E-03	1.4	-75.0		
13	80.10	-3.06	0.010	-6.31E-04	-2.0	-75.2		93940
14	79.50	0.94	0.010	-1.45E-04	-2.6	-76.7		93940
15	78.95	7.70	0.010	3.05E-04	-0.2	-77.6		93940
16	78.47	14.17	0.010	6.95E-04	5.0	-76.7		93940
17	78.00	21.23	0.010	1.07E-03	13.4	-72.5		93940
18	77.50	25.39	0.009	1.43E-03	25.0	-63.1		93940
19	77.00	29.68	0.008	1.72E-03	38.8	-47.4		93940
20	76.50	34.33	0.007	1.91E-03	54.8	-24.3		93940
21	76.00	39.10	0.006	1.96E-03	73.2	7.5		93940
		-70.29	0.006	1.96E-03	73.2	7.5		
22	75.75	-62.65	0.006	1.92E-03	56.5	23.6		93940
23	75.25	-47.40	0.005	1.74E-03	29.0	44.0		93940
24	74.83	-35.29	0.004	1.52E-03	11.5	52.0		93940
25	74.40	-24.59	0.004	1.28E-03	-1.3	53.7		93940
26	73.95	-15.12	0.003	1.03E-03	-10.2	50.6		93940
27	73.50	-7.68	0.003	8.09E-04	-15.3	44.4		93940
28	72.75	0.96	0.002	5.09E-04	-17.9	30.6		93940

(continued)

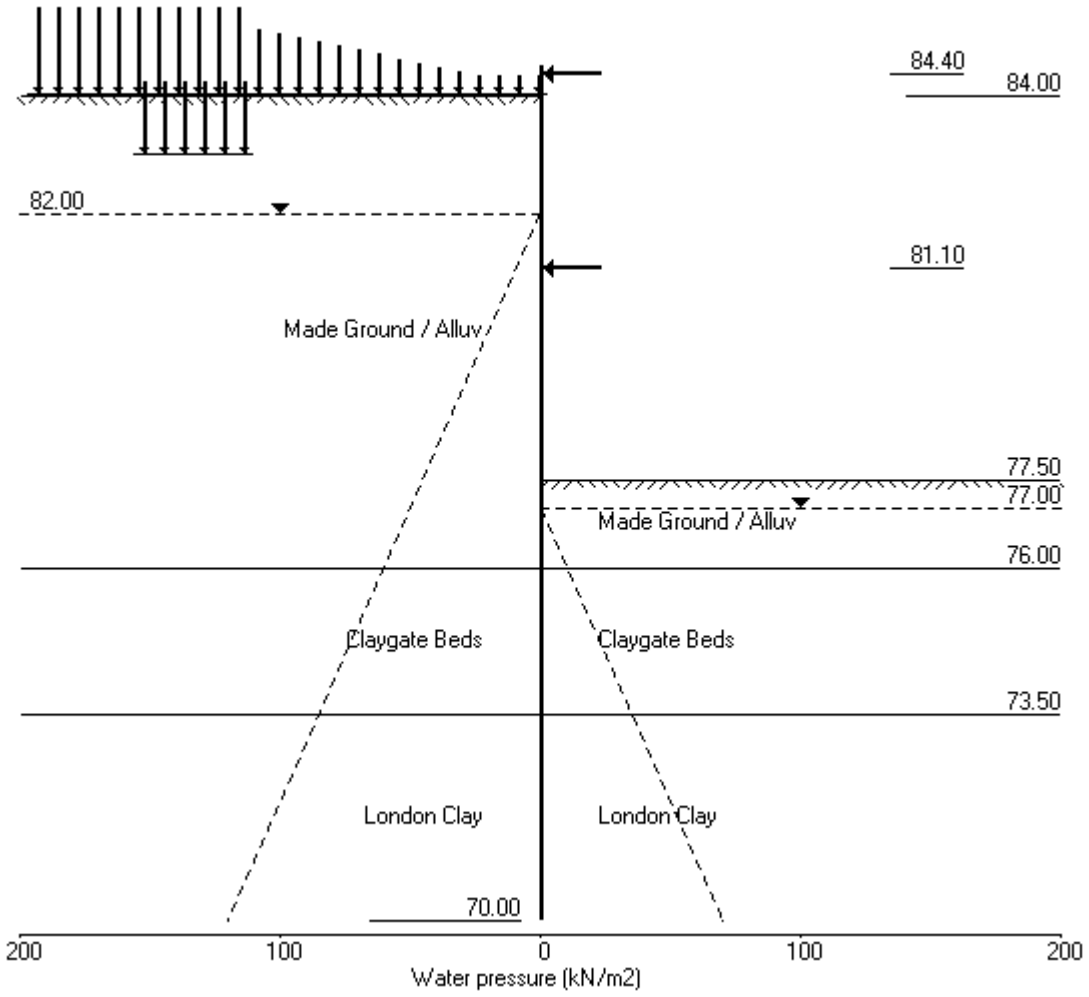
Stage No.8 Excavate to elevation 80.60 on PASSIVE side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
29	72.00	5.49	0.002	3.18E-04	-15.4	17.3		93940
30	71.20	7.63	0.002	2.16E-04	-10.2	6.6		93940
31	70.60	8.50	0.001	1.90E-04	-5.3	1.8		93940
32	70.00	9.31	0.001	1.84E-04	0.0	-0.0		---

At elev. 84.40 Strut force = 85.2 kN/strut = 28.4 kN/m run

Units: kN,m

Stage No.11 Excav. to elev. 77.50 on PASSIVE side



Units: kN,m

Stage No. 11 Excavate to elevation 77.50 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
11	84.00	77.50		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-2.50E-03	0.0	-0.0		93940
2	84.40	0.00	0.001	-2.50E-03	0.0	0.0	-0.0	93940
3	84.00	0.00	0.002	-2.50E-03	0.0	-0.0		93940
		1.77	0.002	-2.50E-03	0.0	-0.0		
4	83.85	2.84	0.002	-2.50E-03	0.3	0.0		93940
5	83.43	5.71	0.003	-2.51E-03	2.2	0.5		93940
6	83.00	8.28	0.004	-2.51E-03	5.1	2.0		93940
7	82.50	10.72	0.006	-2.53E-03	9.9	5.7		93940
8	82.00	12.28	0.007	-2.58E-03	15.6	12.1		93940
9	81.75	12.66	0.008	-2.62E-03	18.8	16.4		93940
10	81.10	14.50	0.009	-2.78E-03	27.6	31.6	140.1	93940
		14.50	0.009	-2.78E-03	-112.6	31.6		
11	81.00	15.00	0.010	-2.81E-03	-111.1	20.4		93940
12	80.60	21.36	0.011	-2.81E-03	-103.8	-22.7		93940
13	80.10	30.15	0.012	-2.56E-03	-90.9	-71.5		93940
14	79.50	40.58	0.014	-1.94E-03	-69.7	-120.0		93940
15	78.95	50.03	0.014	-1.15E-03	-44.8	-151.7		93940
16	78.47	58.14	0.015	-3.48E-04	-19.1	-167.1		93940
17	78.00	66.19	0.015	5.02E-04	10.4	-169.4		93940
18	77.50	74.61	0.014	1.36E-03	45.6	-155.6		93940
		50.14	0.014	1.36E-03	45.6	-155.6		
19	77.00	58.93	0.013	2.11E-03	72.9	-126.4		93940
20	76.50	63.65	0.012	2.67E-03	103.5	-82.6		93940
21	76.00	71.54	0.011	2.95E-03	137.3	-22.8		93940
		-92.81	0.011	2.95E-03	137.3	-22.8		
22	75.75	-97.34	0.010	2.97E-03	113.6	9.0		93940
23	75.25	-90.11	0.009	2.80E-03	66.7	53.1		93940
24	74.83	-70.38	0.007	2.51E-03	32.6	74.9		93940
25	74.40	-51.10	0.006	2.16E-03	6.8	82.3		93940
26	73.95	-33.59	0.006	1.77E-03	-12.3	80.2		93940
27	73.50	-19.39	0.005	1.41E-03	-24.2	71.2		93940
		-9.05	0.005	1.41E-03	-24.2	71.2		

(continued)

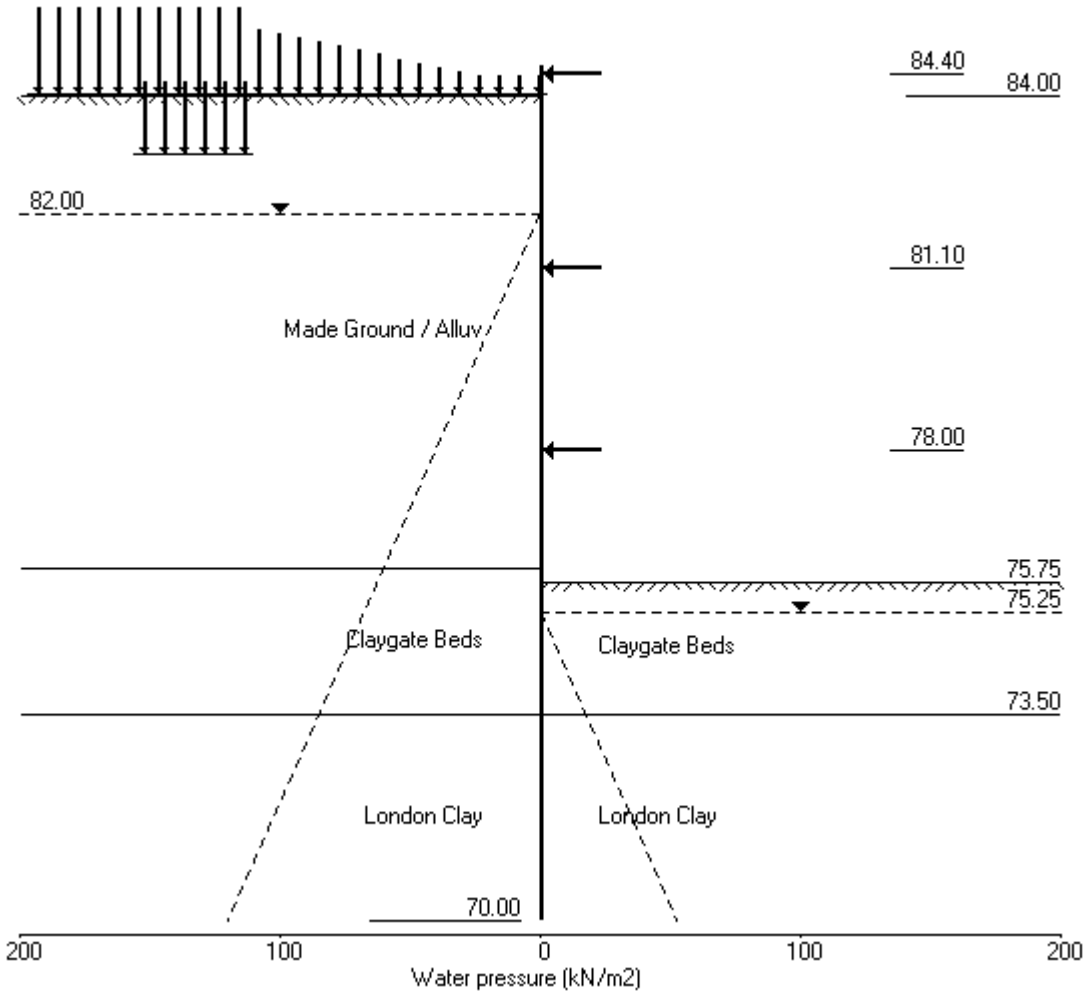
Stage No.11 Excavate to elevation 77.50 on PASSIVE side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
28	72.75	-2.08	0.004	9.15E-04	-28.4	52.8		93940
29	72.00	7.66	0.003	5.82E-04	-26.3	30.7		93940
30	71.20	12.82	0.003	4.01E-04	-18.1	11.9		93940
31	70.60	15.13	0.003	3.52E-04	-9.7	3.2		93940
32	70.00	17.23	0.003	3.42E-04	0.0	0.0		---

At elev. 84.40 The strut is slack
At elev. 81.10 Strut force = 420.4 kN/strut = 140.1 kN/m run

Units: kN,m

Stage No.14 Excav. to elev. 75.75 on PASSIVE side



Units: kN,m

Stage No. 14 Excavate to elevation 75.75 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
14	84.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	0.001	-2.48E-03	0.0	-0.0		93940
2	84.40	0.00	0.001	-2.48E-03	0.0	0.0	0.5	93940
		0.00	0.001	-2.48E-03	-0.5	-0.0		
3	84.00	0.00	0.002	-2.48E-03	-0.5	-0.2		93940
		1.27	0.002	-2.48E-03	-0.5	-0.2		
4	83.85	2.36	0.002	-2.48E-03	-0.2	-0.2		93940
5	83.43	5.33	0.003	-2.48E-03	1.4	-0.0		93940
6	83.00	8.00	0.005	-2.48E-03	4.3	1.1		93940
7	82.50	10.57	0.006	-2.50E-03	8.9	4.4		93940
8	82.00	12.29	0.007	-2.54E-03	14.6	10.3		93940
9	81.75	12.75	0.008	-2.57E-03	17.8	14.3		93940
10	81.10	14.83	0.009	-2.72E-03	26.7	28.8	123.4	93940
		14.83	0.009	-2.72E-03	-96.7	28.8		
11	81.00	15.37	0.010	-2.74E-03	-95.1	19.2		93940
12	80.60	21.91	0.011	-2.75E-03	-87.7	-17.4		93940
13	80.10	30.82	0.012	-2.55E-03	-74.5	-58.1		93940
14	79.50	41.07	0.013	-2.05E-03	-52.9	-96.6		93940
15	78.95	50.03	0.014	-1.42E-03	-27.9	-119.0		93940
16	78.47	58.14	0.015	-8.05E-04	-2.2	-126.4		93940
17	78.00	66.19	0.015	-1.81E-04	27.3	-120.6	78.0	93940
		66.19	0.015	-1.81E-04	-50.7	-120.6		
18	77.50	74.61	0.015	5.05E-04	-15.5	-137.5		93940
19	77.00	83.00	0.015	1.23E-03	23.9	-135.7		93940
20	76.50	91.35	0.014	1.89E-03	67.5	-113.2		93940
21	76.00	99.68	0.013	2.37E-03	115.3	-67.9		93940
		40.00	0.013	2.37E-03	115.3	-67.9		
22	75.75	41.25	0.012	2.51E-03	125.4	-37.4		93940
		-68.05	0.012	2.51E-03	125.4	-37.4		
23	75.25	-77.36	0.011	2.57E-03	89.1	15.5		93940
24	74.83	-81.47	0.010	2.43E-03	55.3	48.1		93940
25	74.40	-77.26	0.009	2.17E-03	21.6	63.8		93940

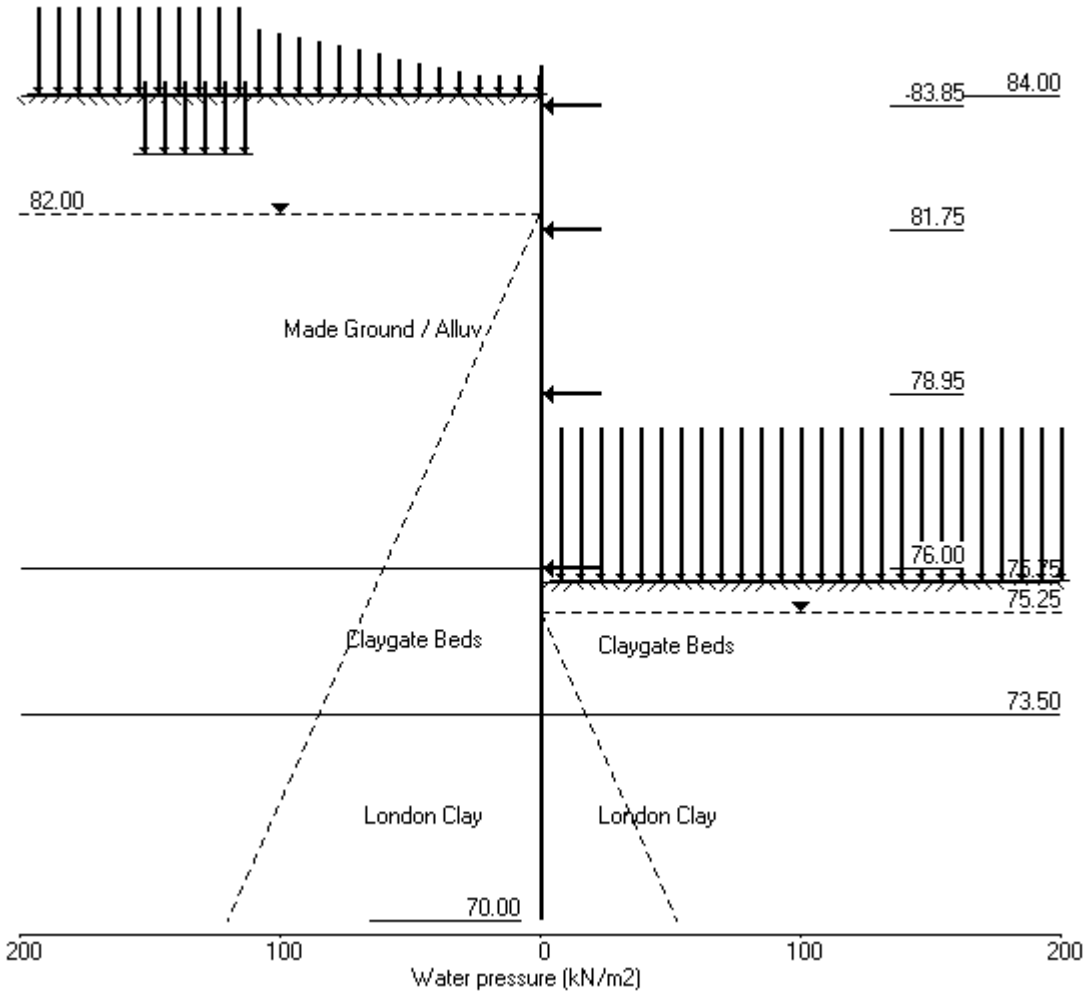
(continued)

Stage No.14 Excavate to elevation 75.75 on PASSIVE side

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
26	73.95	-64.41	0.008	1.86E-03	-10.3	66.6		93940
27	73.50	-50.25	0.007	1.57E-03	-36.1	55.5		93940
		19.82	0.007	1.57E-03	-36.1	55.5		
28	72.75	13.09	0.006	1.21E-03	-23.7	35.0		93940
29	72.00	5.94	0.005	9.96E-04	-16.6	19.1		93940
30	71.20	4.69	0.005	8.76E-04	-12.3	9.1		93940
31	70.60	8.79	0.004	8.35E-04	-8.3	3.5		93940
32	70.00	18.89	0.004	8.24E-04	0.0	0.0		---
At elev. 84.40 Strut force =			1.4 kN/strut =			0.5 kN/m run		
At elev. 81.10 Strut force =			370.1 kN/strut =			123.4 kN/m run		
At elev. 78.00 Strut force =			234.0 kN/strut =			78.0 kN/m run		

Units: kN,m

Stage No.24 Remove strut no.1 at elev. 84.40



Units: kN,m

Stage No. 24 Remove strut or anchor no.1 at elevation 84.40

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
24	84.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	-0.000	-2.80E-03	0.0	-0.0		93940
2	84.40	0.00	0.000	-2.80E-03	0.0	0.0		93940
3	84.00	0.00	0.001	-2.80E-03	0.0	-0.0		93940
		7.73	0.001	-2.80E-03	0.0	-0.0		
4	83.85	8.47	0.002	-2.80E-03	1.2	0.1	-0.0	93940
5	83.43	10.42	0.003	-2.80E-03	5.2	1.5		93940
6	83.00	11.97	0.004	-2.81E-03	10.0	4.7		93940
7	82.50	13.10	0.005	-2.86E-03	16.3	11.3		93940
8	82.00	13.24	0.007	-2.94E-03	22.8	21.2		93940
9	81.75	12.85	0.008	-3.01E-03	26.1	27.3	102.6	93940
		12.85	0.008	-3.01E-03	-76.5	27.3		
10	81.10	14.50	0.010	-3.03E-03	-67.7	-19.5		93940
11	81.00	15.00	0.010	-3.01E-03	-66.2	-26.2		93940
12	80.60	21.36	0.011	-2.84E-03	-58.9	-51.3		93940
13	80.10	30.15	0.012	-2.50E-03	-46.0	-77.7		93940
14	79.50	40.58	0.014	-1.94E-03	-24.8	-99.2		93940
15	78.95	50.03	0.015	-1.34E-03	0.1	-106.2	84.2	93940
		50.03	0.015	-1.34E-03	-84.1	-106.2		
16	78.47	58.60	0.015	-7.17E-04	-58.3	-140.2		93940
17	78.00	66.97	0.015	4.47E-05	-28.5	-161.1		93940
18	77.50	75.55	0.015	9.17E-04	7.1	-166.8		93940
19	77.00	83.95	0.014	1.76E-03	47.0	-153.6		93940
20	76.50	93.06	0.013	2.49E-03	91.3	-119.4		93940
21	76.00	102.51	0.012	2.97E-03	140.2	-62.0	-0.0	93940
		48.49	0.012	2.97E-03	140.2	-62.0		
22	75.75	51.60	0.011	3.09E-03	152.7	-25.0		93940
		-100.14	0.011	3.09E-03	152.7	-25.0		
23	75.25	-101.35	0.010	3.06E-03	102.3	37.5		93940
24	74.83	-99.13	0.008	2.81E-03	59.7	73.6		93940
25	74.40	-89.32	0.007	2.44E-03	19.7	89.6		93940
26	73.95	-71.46	0.006	2.01E-03	-16.5	90.3		93940

(continued)

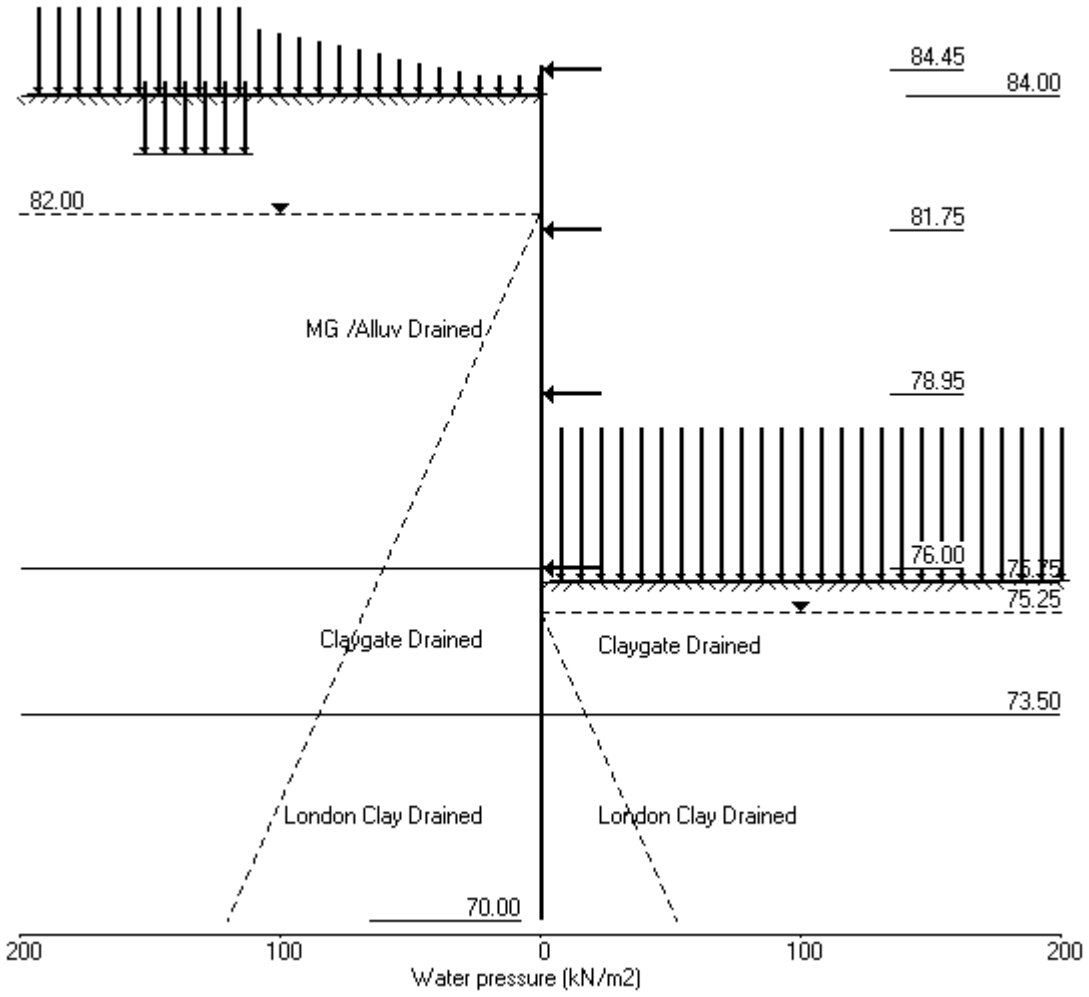
Stage No.24 Remove strut or anchor no.1 at elevation 84.40

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
27	73.50	-53.28	0.005	1.61E-03	-44.6	75.6		93940
		16.79	0.005	1.61E-03	-44.6	75.6		
28	72.75	14.27	0.004	1.11E-03	-32.9	48.2		93940
29	72.00	9.27	0.004	8.23E-04	-24.1	26.0		93940
30	71.20	8.75	0.003	6.63E-04	-16.9	11.4		93940
31	70.60	12.70	0.003	6.14E-04	-10.5	4.0		93940
32	70.00	22.21	0.002	6.01E-04	0.0	0.0		---

At elev. 83.85 The strut is slack
At elev. 81.75 Strut force = 102.6 kN/strut = 102.6 kN/m run
At elev. 78.95 Strut force = 84.2 kN/strut = 84.2 kN/m run
At elev. 76.00 The strut is slack

Units: kN,m

Stage No.30 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 30 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
30	84.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall
Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	84.45	0.00	-0.000	-2.93E-03	0.0	-0.0	-0.0	46970
2	84.40	0.00	-0.000	-2.93E-03	0.0	-0.0		46970
3	84.00	0.00	0.001	-2.93E-03	0.0	-0.0		46970
		9.00	0.001	-2.93E-03	0.0	-0.0		
4	83.85	9.66	0.001	-2.93E-03	1.4	0.1		46970
5	83.43	11.40	0.003	-2.94E-03	5.9	1.6		46970
6	83.00	12.73	0.004	-2.95E-03	11.0	5.2		46970
7	82.50	17.00	0.005	-3.01E-03	18.4	12.6		46970
8	82.00	21.24	0.007	-3.12E-03	28.0	24.2		46970
9	81.75	24.59	0.008	-3.20E-03	33.7	31.9	134.0	46970
		24.59	0.008	-3.20E-03	-100.3	31.9		
10	81.10	33.42	0.010	-3.21E-03	-81.4	-27.3		46970
11	81.00	34.78	0.010	-3.16E-03	-78.0	-35.3		46970
12	80.60	40.23	0.011	-2.91E-03	-63.0	-63.6		46970
13	80.10	47.12	0.013	-2.43E-03	-41.2	-89.7		46970
14	79.50	55.49	0.014	-1.75E-03	-10.4	-105.4		46970
15	78.95	63.23	0.015	-1.14E-03	22.2	-102.3	102.7	46970
		63.23	0.015	-1.14E-03	-80.4	-102.3		
16	78.47	69.94	0.015	-5.75E-04	-48.8	-133.2		46970
17	78.00	76.51	0.015	8.58E-05	-14.0	-148.4		46970
18	77.50	83.16	0.015	7.78E-04	25.9	-145.7		46970
19	77.00	89.57	0.014	1.35E-03	69.1	-122.2		46970
20	76.50	95.55	0.014	1.68E-03	115.4	-76.4		46970
21	76.00	100.93	0.013	1.64E-03	164.5	-6.8	157.4	46970
		140.52	0.013	1.64E-03	7.1	-6.8		
22	75.75	142.48	0.012	1.54E-03	42.5	-0.2		46970
		2.94	0.012	1.54E-03	42.5	-0.2		
23	75.25	-17.73	0.012	1.47E-03	38.8	19.6		46970
24	74.83	-27.73	0.011	1.47E-03	29.1	35.9		46970
25	74.40	-36.36	0.010	1.47E-03	15.5	44.9		46970

(continued)

Stage No.30 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
26	73.95	-43.59	0.010	1.45E-03	-2.5	48.9		46970
27	73.50	-37.20	0.009	1.41E-03	-20.7	43.4		46970
		7.17	0.009	1.41E-03	-20.7	43.4		
28	72.75	2.58	0.008	1.27E-03	-17.0	35.4		46970
29	72.00	3.20	0.007	1.12E-03	-14.8	21.3		46970
30	71.20	3.37	0.006	1.00E-03	-12.2	11.3		46970
31	70.60	7.08	0.006	9.47E-04	-9.1	5.1		46970
32	70.00	23.24	0.005	9.27E-04	0.0	0.0		---

At elev. 84.45 The strut is slack
At elev. 81.75 Strut force = 134.0 kN/strut = 134.0 kN/m run
At elev. 78.95 Strut force = 102.7 kN/strut = 102.7 kN/m run
At elev. 76.00 Strut force = 157.4 kN/strut = 157.4 kN/m run

Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: ULS DA1 Combination 2
Water pressures : Worst Credible
Partial factor on C' = 1.250
Partial factor on Phi' = 1.250
Partial factor on Cu = 1.400
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.300

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 70.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
1	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
2	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
3	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
4	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
5	84.00	84.00	Cant.	Conditions not suitable for FoS calc.			
6	84.00	84.00		No analysis at this stage			
7	84.00	84.00		No analysis at this stage			
8	84.00	80.60	84.40	2.383	n/a	79.82	0.78
9	84.00	80.60		No analysis at this stage			

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 2

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement maximum m	Displacement minimum m	Bending moment maximum kN.m/m	Bending moment minimum kN.m/m	Shear force maximum kN/m	Shear force minimum kN/m
1	84.45	0.001	-0.000	0.0	-0.0	0.0	0.0
2	84.40	0.001	-0.000	0.0	-0.0	0.0	-28.4
3	84.00	0.002	0.000	0.0	-11.4	0.0	-28.4
4	83.85	0.003	0.000	0.1	-15.6	1.4	-28.3
5	83.43	0.004	0.000	1.6	-27.5	5.9	-27.6
6	83.00	0.005	0.000	5.2	-38.9	11.0	-25.9
7	82.50	0.006	0.000	12.6	-51.1	18.4	-22.8
8	82.00	0.007	0.000	24.2	-61.5	28.0	-18.4
9	81.75	0.008	0.000	31.9	-65.7	33.7	-100.3
10	81.10	0.010	0.000	32.9	-73.3	28.5	-112.6
11	81.00	0.010	0.000	23.0	-74.0	0.0	-111.1
12	80.60	0.011	0.000	0.0	-75.0	1.4	-103.8
13	80.10	0.013	0.000	0.0	-89.7	0.0	-90.9
14	79.50	0.014	0.000	0.0	-120.0	0.0	-101.0
15	78.95	0.015	0.000	0.0	-151.7	25.5	-101.9
16	78.47	0.015	0.000	0.0	-167.1	5.0	-70.3
17	78.00	0.016	0.000	0.0	-176.3	27.3	-50.7
18	77.50	0.015	0.000	0.0	-178.2	45.6	-15.5
19	77.00	0.015	0.000	0.0	-161.6	72.9	0.0
20	76.50	0.014	0.000	0.7	-124.1	115.4	0.0
21	76.00	0.013	0.000	7.5	-67.9	164.5	0.0
22	75.75	0.012	0.000	23.6	-37.4	158.0	0.0
23	75.25	0.012	0.000	53.1	0.0	105.1	0.0
24	74.83	0.011	0.000	76.0	0.0	61.0	0.0
25	74.40	0.010	0.000	92.3	0.0	28.9	-1.3
26	73.95	0.010	0.000	92.9	0.0	17.1	-17.1
27	73.50	0.009	0.000	77.9	0.0	9.7	-45.5
28	72.75	0.008	0.000	58.4	0.0	0.0	-33.9
29	72.00	0.007	0.000	42.6	0.0	0.0	-26.3
30	71.20	0.006	0.000	22.7	0.0	0.0	-25.9
31	70.60	0.006	0.000	8.9	0.0	0.0	-19.9
32	70.00	0.005	0.000	0.0	-0.0	0.0	0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment				Shear force			
no.	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	3.0	74.83	-1.3	79.50	2.5	76.00	-0.9	72.75
2	3.2	74.83	-1.9	78.95	3.2	76.00	-1.0	72.75
3	4.7	74.83	-4.6	78.95	5.2	76.00	-1.5	72.75
4	5.5	74.40	-6.4	78.47	6.9	76.00	-1.9	81.10
5	5.6	74.40	-6.8	78.47	7.3	76.00	-2.0	81.10
6	No calculation at this stage							
7	No calculation at this stage							
8	53.7	74.40	-77.6	78.95	73.2	76.00	-28.4	84.40
9	No calculation at this stage							
10	53.3	74.40	-77.5	78.95	72.9	76.00	-28.3	84.40
11	82.3	74.40	-169.4	78.00	137.3	76.00	-112.6	81.10
12	No calculation at this stage							
13	82.1	74.40	-169.0	78.00	137.1	76.00	-112.5	81.10
14	66.6	73.95	-137.5	77.50	125.4	75.75	-96.7	81.10
15	No calculation at this stage							
16	86.8	73.95	-154.5	77.50	146.5	75.75	-104.7	81.10
17	No calculation at this stage							
18	92.9	73.95	-178.2	77.50	158.0	75.75	-101.0	79.50
19	No calculation at this stage							
20	92.0	73.95	-174.3	77.50	156.2	75.75	-99.1	81.10
21	No calculation at this stage							
22	90.3	73.95	-166.8	77.50	152.7	75.75	-84.1	78.95
23	No calculation at this stage							
24	90.3	73.95	-166.8	77.50	152.7	75.75	-84.1	78.95
25	No calculation at this stage							
26	90.3	73.95	-166.8	77.50	152.7	75.75	-84.1	78.95
27	No calculation at this stage							
28	91.1	73.95	-169.1	77.50	155.2	75.75	-101.9	78.95
29	58.4	72.75	-153.4	77.50	154.3	76.00	-98.2	81.75
30	48.9	73.95	-148.4	78.00	164.5	76.00	-100.3	81.75

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	elev.	minimum m	elev.	Stage description
1	0.001	84.45	0.000	84.45	Apply surcharge no.1 at elev. 84.00
2	0.001	84.45	0.000	84.45	Apply surcharge no.2 at elev. 84.00
3	0.001	81.10	0.000	84.45	Apply surcharge no.3 at elev. 84.00
4	0.001	80.10	0.000	84.45	Apply surcharge no.4 at elev. 84.00
5	0.001	80.10	0.000	84.45	Apply surcharge no.5 at elev. 83.00
6	No calculation at this stage				Install strut no.1 at elev. 84.40
7	No calculation at this stage				Apply water pressure profile no.2
8	0.010	79.50	0.000	84.45	Excav. to elev. 80.60 on PASSIVE side
9	No calculation at this stage				Install strut no.2 at elev. 81.10
10	0.010	79.50	0.000	84.45	Apply water pressure profile no.4
11	0.015	78.47	0.000	84.45	Excav. to elev. 77.50 on PASSIVE side
12	No calculation at this stage				Install strut no.3 at elev. 78.00
13	0.015	78.47	0.000	84.45	Apply water pressure profile no.6
14	0.015	78.00	0.000	84.45	Excav. to elev. 75.75 on PASSIVE side
15	No calculation at this stage				Install strut no.4 at elev. 76.00
16	0.015	78.00	0.000	84.45	Apply surcharge no.6 at elev. 75.75
17	No calculation at this stage				Install strut no.5 at elev. 79.50
18	0.016	78.00	0.000	84.45	Remove strut no.3 at elev. 78.00
19	No calculation at this stage				Install strut no.6 at elev. 78.95
20	0.015	78.00	0.000	84.45	Remove strut no.5 at elev. 79.50
21	No calculation at this stage				Install strut no.7 at elev. 81.75
22	0.015	78.00	-0.000	84.45	Remove strut no.2 at elev. 81.10
23	No calculation at this stage				Install strut no.8 at elev. 83.85
24	0.015	78.00	-0.000	84.45	Remove strut no.1 at elev. 84.40
25	No calculation at this stage				Install strut no.9 at elev. 84.45
26	0.015	78.00	-0.000	84.45	Remove strut no.8 at elev. 83.85
27	No calculation at this stage				Change EI of wall to 46970kN.m2/m run
28	0.015	78.00	-0.000	84.45	Change soil type 1 to soil type 4
29	0.015	78.00	-0.000	84.45	Change soil type 2 to soil type 5
30	0.015	78.00	-0.000	84.45	Change soil type 3 to soil type 6

Summary of results (continued)

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev. 84.40		Strut no. 2 at elev. 81.10		Strut no. 3 at elev. 78.00	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
8	28.41	85.22	---	---	---	---
10	28.34	85.03	0.09	0.28	---	---
11	slack	slack	140.15	420.45	---	---
13	slack	slack	140.03	420.08	0.33	0.99
14	0.46	1.39	123.38	370.14	78.00	234.00
16	slack	slack	132.31	396.94	55.24	165.71
18	slack	slack	115.48	346.45	---	---
20	slack	slack	127.56	382.68	---	---
22	slack	slack	---	---	---	---

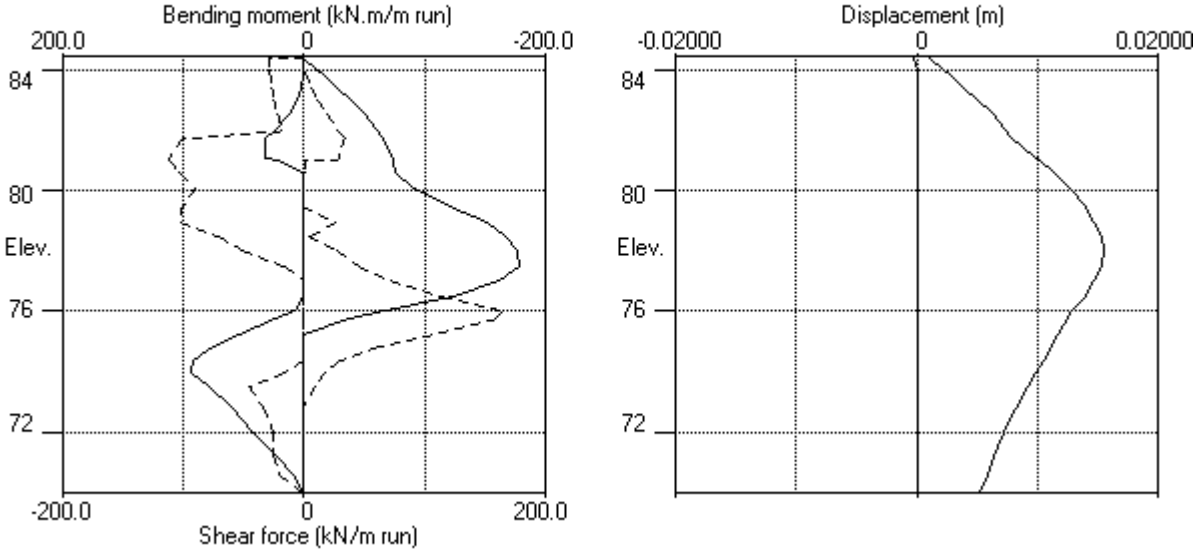
Stage no.	Strut no. 4 at elev. 76.00		Strut no. 5 at elev. 79.50		Strut no. 6 at elev. 78.95	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
16	slack	slack	---	---	---	---
18	slack	slack	56.84	170.53	---	---
20	slack	slack	---	---	47.62	47.62
22	slack	slack	---	---	84.22	84.22
24	slack	slack	---	---	84.22	84.22
26	slack	slack	---	---	84.22	84.22
28	slack	slack	---	---	127.41	127.41
29	138.86	138.86	---	---	114.18	114.18
30	157.38	157.38	---	---	102.66	102.66

Stage no.	Strut no. 7 at elev. 81.75		Strut no. 8 at elev. 83.85		Strut no. 9 at elev. 84.45	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
22	102.65	102.65	---	---	---	---
24	102.65	102.65	slack	slack	---	---
26	102.64	102.64	---	---	slack	slack
28	130.59	130.59	---	---	slack	slack
29	131.55	131.55	---	---	slack	slack
30	134.01	134.01	---	---	slack	slack

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	82.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES

No.	Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	78.60	78.60	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	76.40	76.40	0.0	WC
5	1	81.00	81.00	0.0	1	75.75	75.75	0.0	MC
6	1	82.00	82.00	0.0	1	75.25	75.25	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 72.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	4.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	76.00	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.250000	2.000E+08	1.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	84.40	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	81.50	1.30(A)	0.50	20.00	100.00	=	N/A	1.00 P/U
2	81.50	0.80(A)	20.00	0.50	80.00	=	N/A	1.00 P/U
3	82.00	0.00(A)	20.00	20.00	5.00	=	N/A	1.00 Var
4	75.75	-0.00(P)	8.00	10.00	52.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 81.50
2	Apply surcharge no.2 at elevation 81.50
3	Apply surcharge no.3 at elevation 82.00
4	Apply water pressure profile no.1 (Mod. Conserv.)
5	Excavate to elevation 80.60 on PASSIVE side
6	Install strut or anchor no.2 at elevation 81.10
7	Apply water pressure profile no.3 (Mod. Conserv.)
	No analysis at this stage
8	Excavate to elevation 77.50 on PASSIVE side
9	Install strut or anchor no.3 at elevation 78.00
10	Apply water pressure profile no.5 (Mod. Conserv.)
11	Excavate to elevation 75.75 on PASSIVE side
12	Install strut or anchor no.4 at elevation 76.00
13	Apply surcharge no.4 at elevation 75.75
14	Install strut or anchor no.5 at elevation 79.50
15	Remove strut or anchor no.3 at elevation 78.00
16	Install strut or anchor no.6 at elevation 78.95
17	Remove strut or anchor no.5 at elevation 79.50
18	Install strut or anchor no.7 at elevation 81.75
19	Remove strut or anchor no.2 at elevation 81.10
20	Change properties of soil type 1 to soil type 4
	Ko pressures will be reset
21	Change properties of soil type 2 to soil type 5
	Ko pressures will be reset
22	Change properties of soil type 3 to soil type 6
	Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: Serviceability Limit State
All loads and soil strengths are unfactored

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom., Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 81.50	No	No	No
2	Apply surcharge no.2 at elev. 81.50	No	No	No
3	Apply surcharge no.3 at elev. 82.00	No	No	No
4	Apply water pressure profile no.1	No	No	No
5	Excav. to elev. 80.60 on PASSIVE side	No	No	No
6	Install strut no.2 at elev. 81.10	No	No	No
7	Apply water pressure profile no.3	No	No	No
8	Excav. to elev. 77.50 on PASSIVE side	No	No	No
9	Install strut no.3 at elev. 78.00	No	No	No
10	Apply water pressure profile no.5	No	No	No
11	Excav. to elev. 75.75 on PASSIVE side	No	No	No
12	Install strut no.4 at elev. 76.00	No	No	No
13	Apply surcharge no.4 at elev. 75.75	No	No	No
14	Install strut no.5 at elev. 79.50	No	No	No
15	Remove strut no.3 at elev. 78.00	No	No	No
16	Install strut no.6 at elev. 78.95	No	No	No
17	Remove strut no.5 at elev. 79.50	No	No	No
18	Install strut no.7 at elev. 81.75	No	No	No
19	Remove strut no.2 at elev. 81.10	No	No	No
20	Change soil type 1 to soil type 4	No	No	No
21	Change soil type 2 to soil type 5	No	No	No
22	Change soil type 3 to soil type 6	Yes	No	Yes
*	Summary output	Yes	-	Yes

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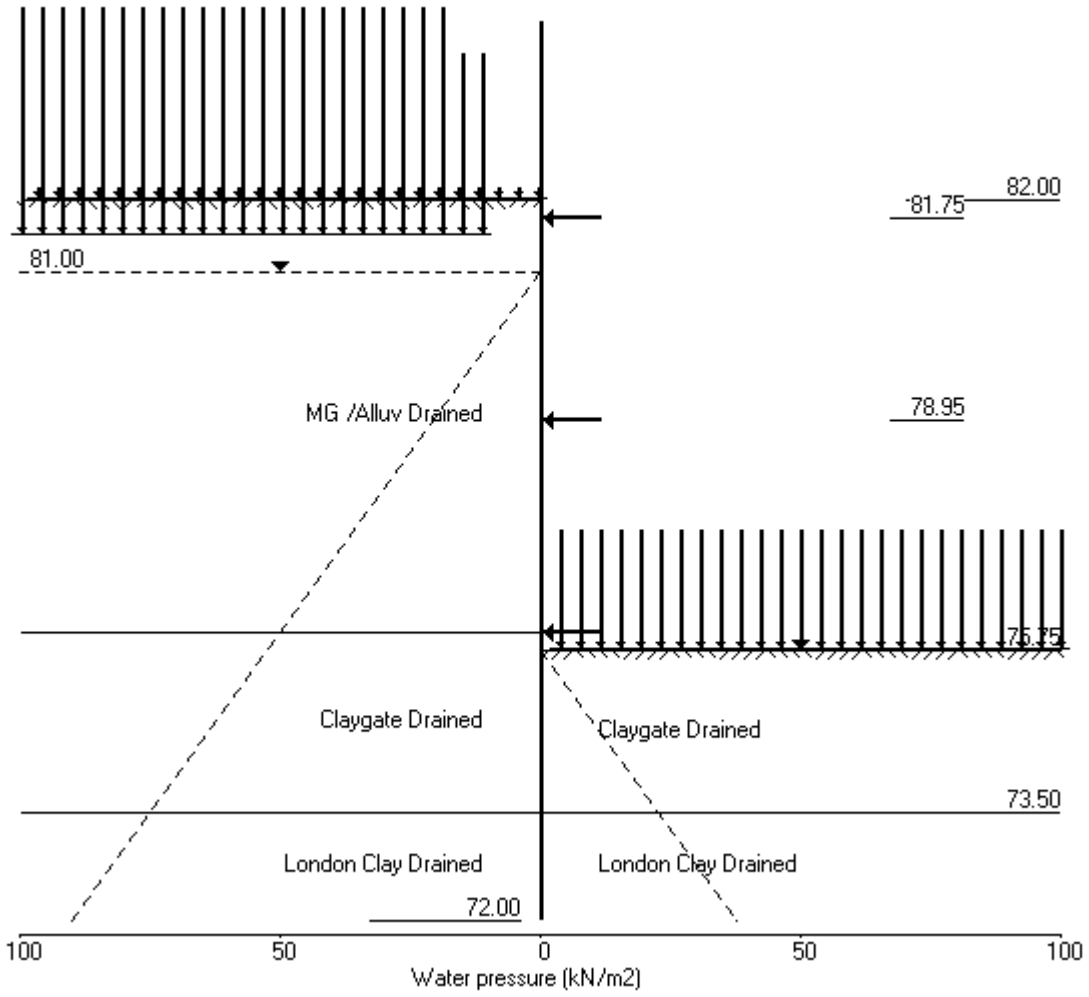
Units: kN,m

Stage No.22 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 22 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
22	82.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall
Limit State: Serviceability Limit State
Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	82.00	18.00	0.007	-1.26E-03	0.0	0.0	
2	81.75	18.61	0.007	-1.27E-03	4.6	0.7	42.6
		18.61	0.007	-1.27E-03	-38.0	0.7	
3	81.50	10.33	0.007	-1.26E-03	-34.4	-8.2	
4	81.10	11.42	0.008	-1.19E-03	-30.0	-20.9	
5	81.00	13.14	0.008	-1.17E-03	-28.8	-23.8	
6	80.60	22.52	0.008	-1.05E-03	-21.7	-34.0	
7	80.05	33.13	0.009	-8.30E-04	-6.4	-41.2	
8	79.50	41.25	0.009	-5.96E-04	14.1	-38.9	
9	78.95	48.20	0.009	-4.10E-04	38.7	-24.7	119.8
		48.20	0.009	-4.10E-04	-81.1	-24.7	
10	78.47	53.86	0.010	-2.02E-04	-56.8	-57.6	
11	78.00	59.41	0.010	1.41E-04	-29.9	-78.4	
12	77.50	65.23	0.009	5.79E-04	1.2	-85.9	
13	77.15	69.33	0.009	8.90E-04	24.8	-81.4	
14	76.80	73.44	0.009	1.16E-03	49.8	-68.5	
15	76.40	78.13	0.008	1.40E-03	80.1	-42.7	
16	76.00	82.79	0.008	1.50E-03	112.3	-4.5	107.5
		116.46	0.008	1.50E-03	4.8	-4.5	
17	75.75	119.47	0.007	1.51E-03	34.3	0.5	
		-34.10	0.007	1.51E-03	34.3	0.5	
18	75.38	-29.31	0.007	1.49E-03	22.4	10.7	
19	75.00	-24.26	0.006	1.43E-03	12.4	16.9	
20	74.40	-16.07	0.005	1.32E-03	0.3	19.2	
21	73.95	-10.01	0.005	1.23E-03	-5.6	17.4	
22	73.50	-4.06	0.004	1.15E-03	-8.8	13.6	
		-5.56	0.004	1.15E-03	-8.8	13.6	
23	73.05	0.83	0.004	1.10E-03	-9.8	8.8	
24	72.60	7.83	0.003	1.07E-03	-7.9	4.1	

(continued)

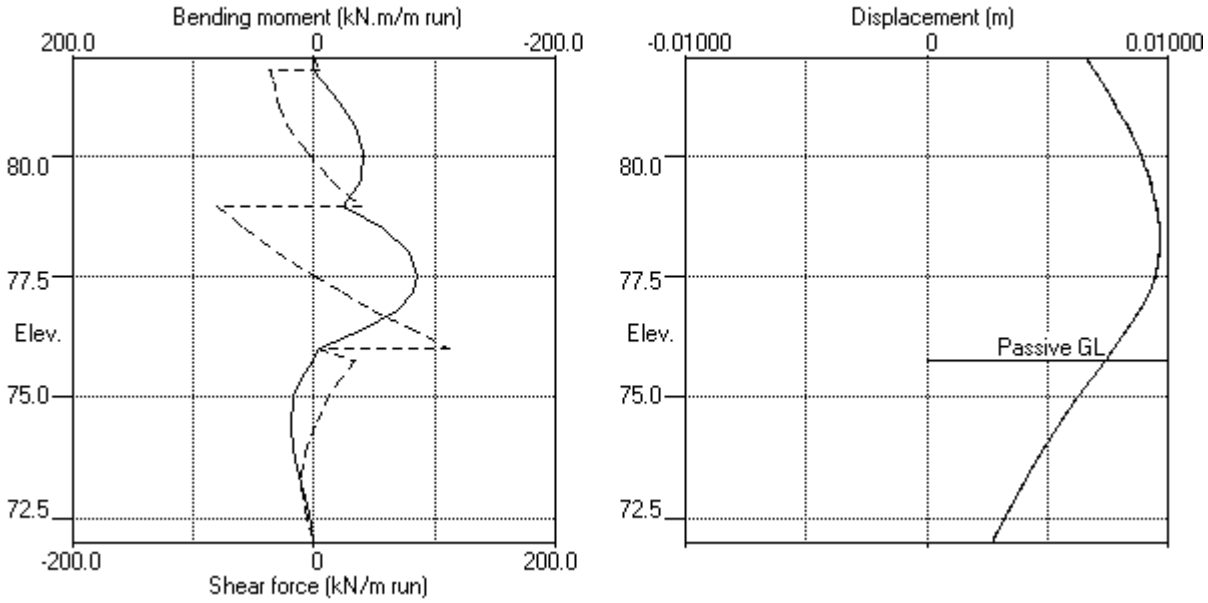
Stage No.22 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
25	72.00	18.47	0.003	1.06E-03	0.0	0.0	

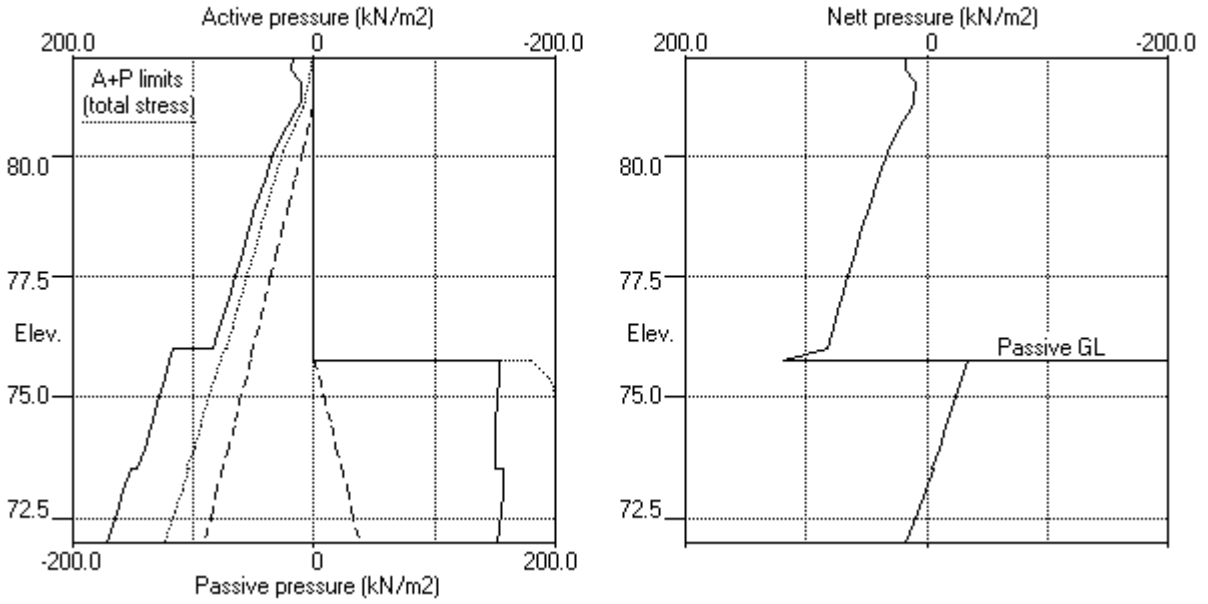
At elev. 81.75 Strut force = 42.6 kN/strut = 42.6 kN/m run
At elev. 78.95 Strut force = 119.8 kN/strut = 119.8 kN/m run
At elev. 76.00 Strut force = 107.5 kN/strut = 107.5 kN/m run

Units: kN,m

Stage No.22 Change soil type 3 to soil type 6



Stage No.22 Change soil type 3 to soil type 6



Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: Serviceability Limit State

All loads and soil strengths are unfactored

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
1	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
2	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
3	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
4	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
5	82.00	80.60	Cant.	3.285	73.40	80.34	0.26
6	82.00	80.60		No analysis at this stage			
7	82.00	80.60		No analysis at this stage			
8	82.00	77.50	81.10	2.442	n/a	76.58	0.92
9	82.00	77.50		No analysis at this stage			

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment Calculated		Bending moment Factored		Shear force Calculated		Shear force Factored	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
		m	m	kN.m/m		kN.m/m		kN/m	kN/m	kN/m	kN/m
1	82.00	0.008	0.000	0	-0	0	-0	0	0	0	0
2	81.75	0.008	0.000	1	-0	1	-0	6	-38	8	-51
3	81.50	0.008	0.000	3	-8	4	-11	9	-34	13	-46
4	81.10	0.008	0.000	8	-21	10	-28	13	-47	17	-64
5	81.00	0.008	0.000	4	-24	5	-32	3	-47	3	-63
6	80.60	0.008	0.000	2	-34	3	-46	5	-44	7	-60
7	80.05	0.009	0.000	4	-41	5	-56	0	-40	0	-54
8	79.50	0.009	0.000	2	-58	2	-78	15	-50	21	-68
9	78.95	0.009	0.000	0	-73	0	-98	40	-95	54	-128
10	78.47	0.010	0.000	0	-80	0	-109	2	-71	2	-96
11	78.00	0.010	0.000	0	-90	0	-122	15	-44	20	-59
12	77.50	0.010	0.000	0	-103	0	-139	25	-15	34	-20
13	77.15	0.009	0.000	0	-104	0	-140	33	-0	45	-0
14	76.80	0.009	0.000	0	-96	0	-129	50	0	67	0
15	76.40	0.008	0.000	5	-75	6	-102	80	0	108	0
16	76.00	0.008	0.000	12	-43	16	-58	112	0	152	0
17	75.75	0.007	0.000	17	-19	23	-25	108	0	146	0
18	75.38	0.007	0.000	26	-3	35	-4	71	0	95	0
19	75.00	0.006	0.000	36	0	49	0	39	0	53	0
20	74.40	0.005	0.000	46	0	62	0	6	-7	8	-9
21	73.95	0.005	0.000	42	0	57	0	4	-16	6	-21
22	73.50	0.004	0.000	33	0	44	0	7	-25	10	-34
23	73.05	0.004	0.000	20	0	27	0	0	-27	0	-36
24	72.60	0.003	0.000	9	0	12	0	0	-21	0	-28
25	72.00	0.003	0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment						Shear force					
	Calculated				Factored		Calculated				Factored	
no.	max.	elev.	min.	elev.	max.	min.	max.	elev.	min.	elev.	max.	min.
	kN.m/m		kN.m/m		kN.m/m		kN/m		kN/m		kN/m	kN/m
1	1	74.40	-5	78.47	2	-6	3	76.00	-2	80.05	5	-3
2	7	75.00	-16	78.95	10	-22	12	76.00	-9	80.60	16	-12
3	9	75.00	-18	78.95	13	-24	15	76.00	-10	80.60	20	-13
4	9	75.00	-17	78.95	13	-24	15	76.00	-10	80.60	20	-13
5	22	75.00	-5	78.00	29	-7	22	76.00	-10	73.50	30	-14
6	No calculation at this stage											
7	No calculation at this stage											
8	35	74.40	-81	78.00	47	-110	71	76.00	-47	81.10	95	-64
9	No calculation at this stage											
10	35	74.40	-81	78.00	47	-109	70	76.00	-47	81.10	95	-64
11	25	74.40	-68	77.15	34	-92	70	75.75	-39	81.10	95	-52
12	No calculation at this stage											
13	41	74.40	-80	77.50	55	-108	88	75.75	-45	81.10	119	-60
14	No calculation at this stage											
15	44	74.40	-93	77.50	59	-125	94	75.75	-50	79.50	127	-68
16	No calculation at this stage											
17	43	74.40	-90	77.50	58	-122	93	75.75	-41	81.10	126	-56
18	No calculation at this stage											
19	42	74.40	-87	77.50	57	-117	92	75.75	-44	78.95	124	-59
20	46	74.40	-104	77.15	62	-140	108	75.75	-95	78.95	146	-128
21	12	73.50	-91	77.50	16	-122	106	76.00	-87	78.95	144	-117
22	19	74.40	-86	77.50	26	-116	112	76.00	-81	78.95	152	-109

Maximum and minimum displacement at each stage

Stage	Displacement				Stage description
no.	maximum	elev.	minimum	elev.	
	m		m		
1	0.000	78.47	0.000	82.00	Apply surcharge no.1 at elev. 81.50
2	0.002	79.50	0.000	82.00	Apply surcharge no.2 at elev. 81.50
3	0.003	79.50	0.000	82.00	Apply surcharge no.3 at elev. 82.00
4	0.003	79.50	0.000	82.00	Apply water pressure profile no.1
5	0.008	82.00	0.000	82.00	Excav. to elev. 80.60 on PASSIVE side
6	No calculation at this stage				Install strut no.2 at elev. 81.10
7	No calculation at this stage				Apply water pressure profile no.3
8	0.009	78.47	0.000	82.00	Excav. to elev. 77.50 on PASSIVE side
9	No calculation at this stage				Install strut no.3 at elev. 78.00
10	0.009	78.47	0.000	82.00	Apply water pressure profile no.5
11	0.009	78.47	0.000	82.00	Excav. to elev. 75.75 on PASSIVE side
12	No calculation at this stage				Install strut no.4 at elev. 76.00
13	0.009	78.47	0.000	82.00	Apply surcharge no.4 at elev. 75.75
14	No calculation at this stage				Install strut no.5 at elev. 79.50
15	0.010	78.47	0.000	82.00	Remove strut no.3 at elev. 78.00
16	No calculation at this stage				Install strut no.6 at elev. 78.95
17	0.010	78.47	0.000	82.00	Remove strut no.5 at elev. 79.50
18	No calculation at this stage				Install strut no.7 at elev. 81.75
19	0.010	78.47	0.000	82.00	Remove strut no.2 at elev. 81.10
20	0.010	78.00	0.000	82.00	Change soil type 1 to soil type 4
21	0.010	78.00	0.000	82.00	Change soil type 2 to soil type 5
22	0.010	78.00	0.000	82.00	Change soil type 3 to soil type 6

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 2 at elev. 81.10			Strut no. 3 at elev. 78.00			Strut no. 4 at elev. 76.00		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
8	59	178	240	---	---	---	---	---	---
10	59	178	240	0	1	1	---	---	---
11	51	153	206	48	145	195	---	---	---
13	57	171	230	30	91	123	slack	slack	slack
15	49	146	197	---	---	---	slack	slack	slack
17	54	161	218	---	---	---	slack	slack	slack
19	---	---	---	---	---	---	slack	slack	slack
20	---	---	---	---	---	---	slack	slack	slack
21	---	---	---	---	---	---	101	101	137
22	---	---	---	---	---	---	107	107	145

Stage no.	Strut no. 5 at elev. 79.50			Strut no. 6 at elev. 78.95			Strut no. 7 at elev. 81.75		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
15	29	87	118	---	---	---	---	---	---
17	---	---	---	25	25	34	---	---	---
19	---	---	---	43	43	58	39	39	52
20	---	---	---	135	135	182	42	42	56
21	---	---	---	127	127	171	41	41	56
22	---	---	---	120	120	162	43	43	57

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

GEOTECHNICAL & ENVIRONMENTAL ASSOCIATES | Sheet No.
Program: WALLAP Version 6.05 Revision A45.B58.R48 | Job No. J11251D
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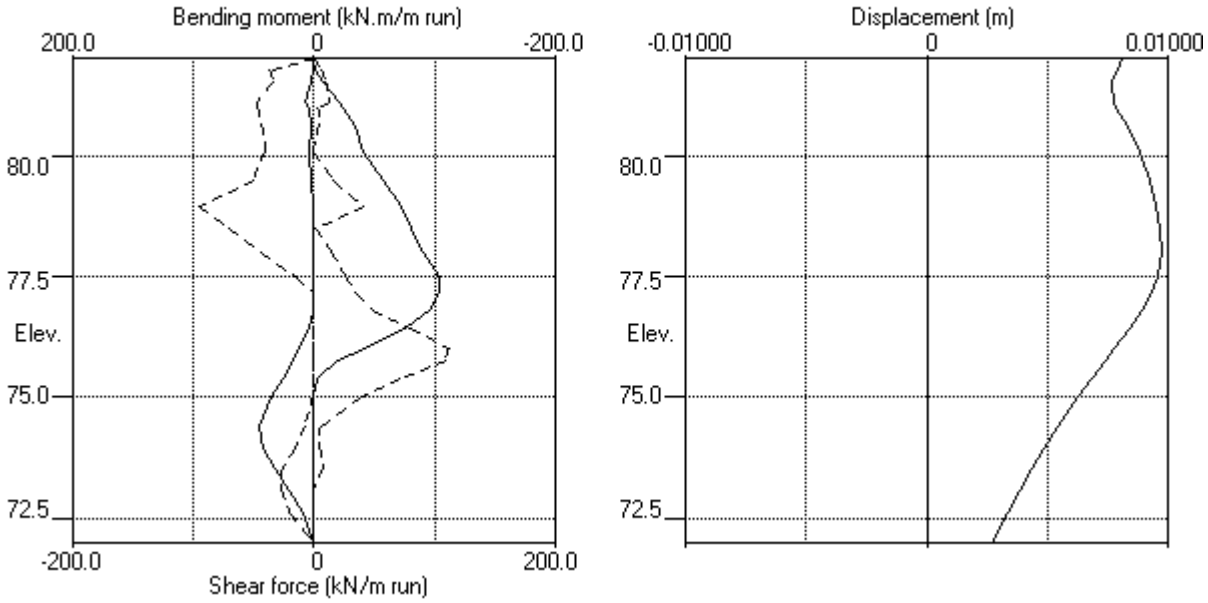
Data filename/Run ID: 59 Maresfield Gdns Scheme 4 South Wall_SLS
59 Maresfield Gardens Scheme 4 | Date:24-03-2015
South Wall SLS | Checked :

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	82.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES (Unfactored SLS soil strengths)

No.	Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type ------- Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	78.60	78.60	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	76.40	76.40	0.0	WC
5	1	81.00	81.00	0.0	1	75.75	75.75	0.0	MC
6	1	82.00	82.00	0.0	1	75.25	75.25	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 72.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	4.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	76.00	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.250000	2.000E+08	1.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	84.40	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	81.50	1.30(A)	0.50	20.00	100.00	=	N/A	1.00 P/U
2	81.50	0.80(A)	20.00	0.50	80.00	=	N/A	1.00 P/U
3	82.00	0.00(A)	20.00	20.00	5.00	=	N/A	1.10 Var
4	75.75	-0.00(P)	8.00	10.00	52.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 81.50
2	Apply surcharge no.2 at elevation 81.50
3	Apply surcharge no.3 at elevation 82.00
4	Apply water pressure profile no.1 (Mod. Conserv.)
5	Excavate to elevation 80.60 on PASSIVE side
6	Install strut or anchor no.2 at elevation 81.10
7	Apply water pressure profile no.3 (Mod. Conserv.)
	No analysis at this stage
8	Excavate to elevation 77.50 on PASSIVE side
9	Install strut or anchor no.3 at elevation 78.00
10	Apply water pressure profile no.5 (Mod. Conserv.)
11	Excavate to elevation 75.75 on PASSIVE side
12	Install strut or anchor no.4 at elevation 76.00
13	Apply surcharge no.4 at elevation 75.75
14	Install strut or anchor no.5 at elevation 79.50
15	Remove strut or anchor no.3 at elevation 78.00
16	Install strut or anchor no.6 at elevation 78.95
17	Remove strut or anchor no.5 at elevation 79.50
18	Install strut or anchor no.7 at elevation 81.75
19	Remove strut or anchor no.2 at elevation 81.10
20	Change properties of soil type 1 to soil type 4
	Ko pressures will be reset
21	Change properties of soil type 2 to soil type 5
	Ko pressures will be reset
22	Change properties of soil type 3 to soil type 6
	Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 1
Water pressures : Moderately Conservative
Partial factor on C' = 1.000
Partial factor on Phi' = 1.000
Partial factor on Cu = 1.000
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.100
Design factor on calculated Bending Moments = 1.350

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom., Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 81.50	No	No	No
2	Apply surcharge no.2 at elev. 81.50	No	No	No
3	Apply surcharge no.3 at elev. 82.00	No	No	No
4	Apply water pressure profile no.1	No	No	No
5	Excav. to elev. 80.60 on PASSIVE side	No	No	No
6	Install strut no.2 at elev. 81.10	No	No	No
7	Apply water pressure profile no.3	No	No	No
8	Excav. to elev. 77.50 on PASSIVE side	No	No	No
9	Install strut no.3 at elev. 78.00	No	No	No
10	Apply water pressure profile no.5	No	No	No
11	Excav. to elev. 75.75 on PASSIVE side	No	No	No
12	Install strut no.4 at elev. 76.00	No	No	No
13	Apply surcharge no.4 at elev. 75.75	No	No	No
14	Install strut no.5 at elev. 79.50	No	No	No
15	Remove strut no.3 at elev. 78.00	No	No	No
16	Install strut no.6 at elev. 78.95	No	No	No
17	Remove strut no.5 at elev. 79.50	No	No	No
18	Install strut no.7 at elev. 81.75	No	No	No
19	Remove strut no.2 at elev. 81.10	No	No	No
20	Change soil type 1 to soil type 4	No	No	No
21	Change soil type 2 to soil type 5	No	No	No
22	Change soil type 3 to soil type 6	Yes	No	Yes
*	Summary output	Yes	-	Yes

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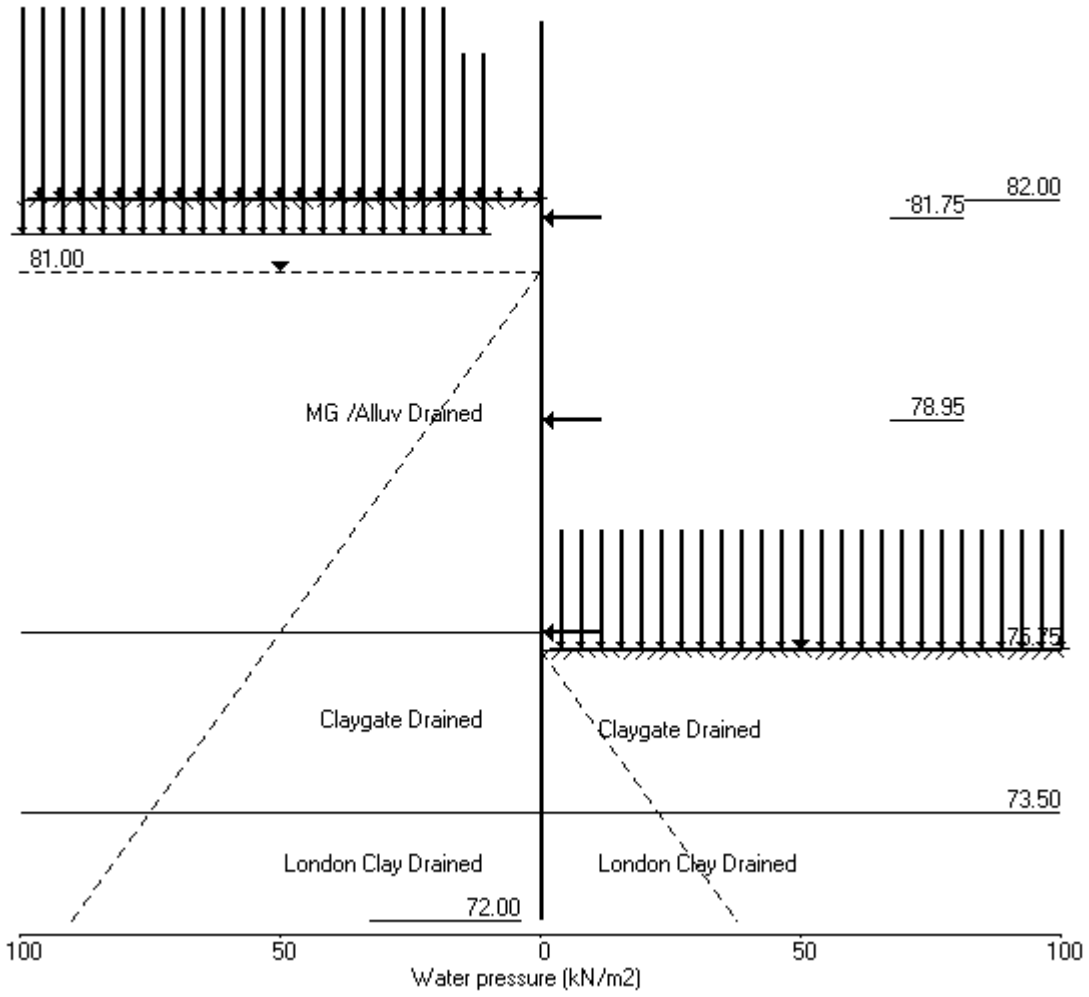
Units: kN,m

Stage No.22 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 22 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	82.00	19.80	0.007	-1.27E-03	0.0	0.0	
2	81.75	18.66	0.007	-1.27E-03	4.8	0.7	43.2
		18.66	0.007	-1.27E-03	-38.4	0.7	
3	81.50	10.35	0.007	-1.26E-03	-34.8	-8.3	
4	81.10	11.66	0.008	-1.19E-03	-30.4	-21.1	
5	81.00	13.39	0.008	-1.17E-03	-29.1	-24.1	
6	80.60	22.76	0.008	-1.05E-03	-21.9	-34.4	
7	80.05	33.38	0.009	-8.28E-04	-6.4	-41.6	
8	79.50	41.50	0.009	-5.91E-04	14.2	-39.3	
9	78.95	48.44	0.010	-4.03E-04	38.9	-25.0	120.1
		48.44	0.010	-4.03E-04	-81.2	-25.0	
10	78.47	54.11	0.010	-1.93E-04	-56.9	-58.0	
11	78.00	59.65	0.010	1.52E-04	-29.8	-78.8	
12	77.50	65.48	0.010	5.90E-04	1.4	-86.1	
13	77.15	69.57	0.009	9.03E-04	25.1	-81.6	
14	76.80	73.68	0.009	1.18E-03	50.2	-68.5	
15	76.40	78.37	0.008	1.41E-03	80.6	-42.6	
16	76.00	83.03	0.008	1.51E-03	112.8	-4.1	108.2
		116.93	0.008	1.51E-03	4.6	-4.1	
17	75.75	119.93	0.007	1.52E-03	34.2	0.8	
		-34.19	0.007	1.52E-03	34.2	0.8	
18	75.38	-29.37	0.007	1.49E-03	22.3	11.0	
19	75.00	-24.29	0.006	1.44E-03	12.3	17.1	
20	74.40	-16.06	0.005	1.32E-03	0.1	19.3	
21	73.95	-9.99	0.005	1.23E-03	-5.7	17.5	
22	73.50	-4.02	0.004	1.16E-03	-8.9	13.7	
		-5.52	0.004	1.16E-03	-8.9	13.7	
23	73.05	0.89	0.004	1.11E-03	-9.9	8.8	
24	72.60	7.90	0.003	1.07E-03	-7.9	4.2	
25	72.00	18.56	0.003	1.06E-03	0.0	0.0	

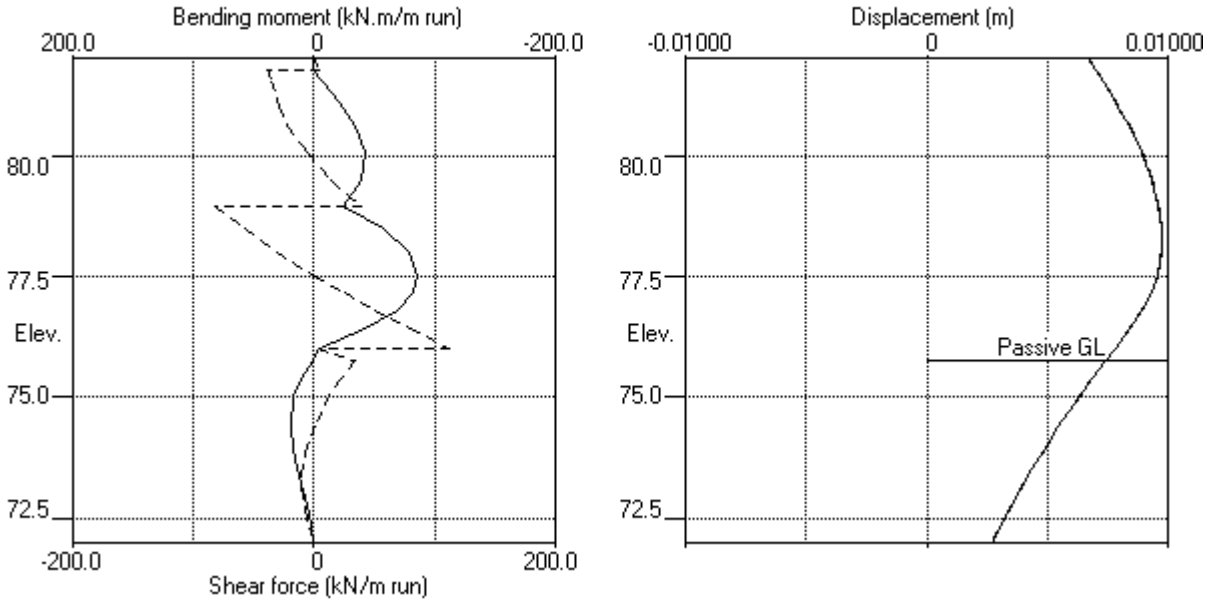
At elev. 81.75 Strut force = 43.2 kN/strut = 43.2 kN/m run
At elev. 78.95 Strut force = 120.1 kN/strut = 120.1 kN/m run
At elev. 76.00 Strut force = 108.2 kN/strut = 108.2 kN/m run

(continued)

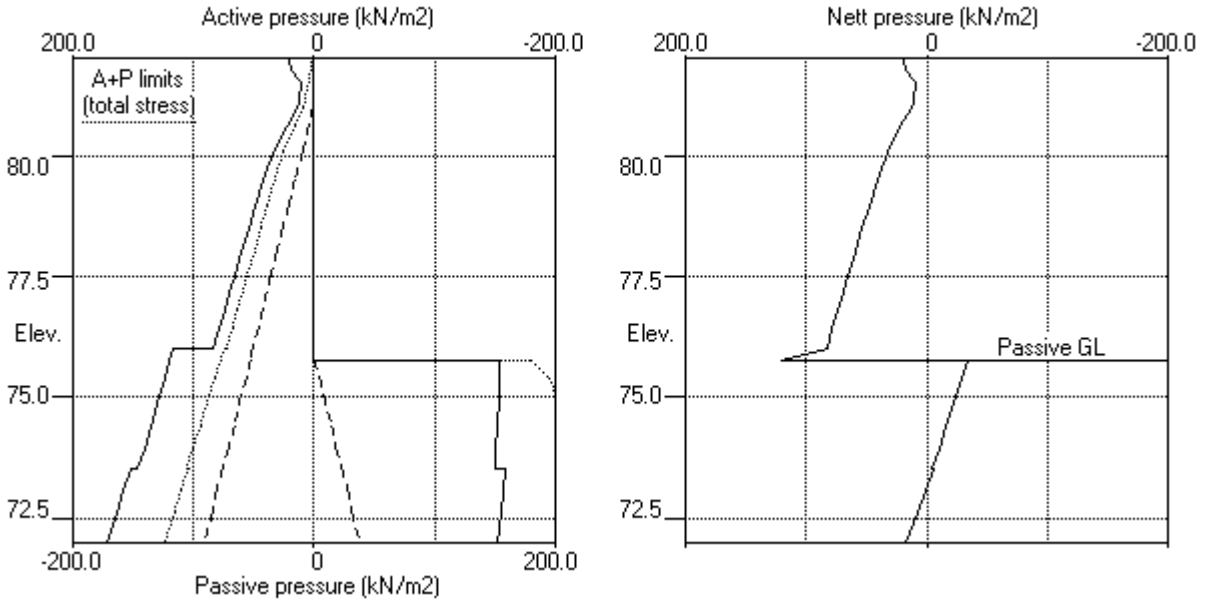
Stage No.22 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Units: kN,m

Stage No.22 Change soil type 3 to soil type 6



Stage No.22 Change soil type 3 to soil type 6



Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment Calculated		Bending moment Factored		Shear force Calculated		Shear force Factored	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
		m	m	kN.m/m		kN.m/m		kN/m	kN/m	kN/m	kN/m
1	82.00	0.008	0.000	0	-0	0	-0	0	0	0	0
2	81.75	0.008	0.000	1	-0	1	-0	6	-38	8	-52
3	81.50	0.008	0.000	3	-8	4	-11	9	-35	13	-47
4	81.10	0.008	0.000	8	-21	10	-28	13	-47	17	-64
5	81.00	0.008	0.000	4	-24	5	-32	3	-47	3	-63
6	80.60	0.008	0.000	2	-34	3	-46	5	-45	7	-60
7	80.05	0.009	0.000	4	-42	5	-56	0	-40	0	-54
8	79.50	0.009	0.000	2	-58	2	-78	15	-51	21	-68
9	78.95	0.010	0.000	0	-73	0	-99	40	-95	54	-129
10	78.47	0.010	0.000	0	-81	0	-109	2	-71	2	-96
11	78.00	0.010	0.000	0	-91	0	-123	15	-44	20	-59
12	77.50	0.010	0.000	0	-104	0	-140	26	-15	34	-20
13	77.15	0.009	0.000	0	-104	0	-140	34	0	46	0
14	76.80	0.009	0.000	0	-96	0	-129	50	0	68	0
15	76.40	0.008	0.000	5	-76	6	-102	81	0	109	0
16	76.00	0.008	0.000	12	-43	16	-58	113	0	152	0
17	75.75	0.007	0.000	17	-18	23	-25	109	0	147	0
18	75.38	0.007	0.000	26	-2	35	-3	71	0	96	0
19	75.00	0.006	0.000	37	0	49	0	40	0	53	0
20	74.40	0.005	0.000	47	0	63	0	6	-7	8	-9
21	73.95	0.005	0.000	43	0	58	0	4	-16	6	-21
22	73.50	0.004	0.000	33	0	44	0	7	-25	10	-34
23	73.05	0.004	0.000	20	0	27	0	0	-27	0	-36
24	72.60	0.003	0.000	9	0	12	0	0	-21	0	-28
25	72.00	0.003	0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment						Shear force					
	Calculated				Factored		Calculated				Factored	
no.	max.	elev.	min.	elev.	max.	min.	max.	elev.	min.	elev.	max.	min.
	kN.m/m		kN.m/m		kN.m/m		kN/m		kN/m		kN/m	kN/m
1	1	74.40	-5	78.47	2	-6	3	76.00	-2	80.05	5	-3
2	7	75.00	-16	78.95	10	-22	12	76.00	-9	80.60	16	-12
3	10	75.00	-18	78.47	13	-24	15	76.00	-10	80.60	20	-13
4	10	75.00	-18	78.47	13	-24	15	76.00	-10	80.60	20	-13
5	22	75.00	-5	78.00	30	-7	23	76.00	-10	73.50	30	-14
6	No calculation at this stage											
7	No calculation at this stage											
8	35	74.40	-82	78.00	48	-110	71	76.00	-47	81.10	96	-64
9	No calculation at this stage											
10	35	74.40	-81	78.00	47	-110	71	76.00	-47	81.10	96	-64
11	25	74.40	-69	77.15	34	-93	71	75.75	-39	81.10	95	-53
12	No calculation at this stage											
13	41	74.40	-80	77.50	55	-108	89	75.75	-45	81.10	120	-61
14	No calculation at this stage											
15	44	74.40	-93	77.50	60	-126	95	75.75	-51	79.50	128	-68
16	No calculation at this stage											
17	44	74.40	-91	77.50	59	-123	94	75.75	-41	81.10	127	-56
18	No calculation at this stage											
19	43	74.40	-87	77.50	58	-118	92	75.75	-44	78.95	124	-59
20	47	74.40	-104	77.15	63	-140	109	75.75	-95	78.95	147	-129
21	12	73.50	-91	77.50	16	-123	107	76.00	-87	78.95	144	-117
22	19	74.40	-86	77.50	26	-116	113	76.00	-81	78.95	152	-110

Maximum and minimum displacement at each stage

Stage	Displacement				Stage description
no.	maximum	elev.	minimum	elev.	
	m		m		
1	0.000	78.47	0.000	82.00	Apply surcharge no.1 at elev. 81.50
2	0.002	79.50	0.000	82.00	Apply surcharge no.2 at elev. 81.50
3	0.003	79.50	0.000	82.00	Apply surcharge no.3 at elev. 82.00
4	0.003	79.50	0.000	82.00	Apply water pressure profile no.1
5	0.008	82.00	0.000	82.00	Excav. to elev. 80.60 on PASSIVE side
6	No calculation at this stage				Install strut no.2 at elev. 81.10
7	No calculation at this stage				Apply water pressure profile no.3
8	0.009	78.47	0.000	82.00	Excav. to elev. 77.50 on PASSIVE side
9	No calculation at this stage				Install strut no.3 at elev. 78.00
10	0.009	78.47	0.000	82.00	Apply water pressure profile no.5
11	0.010	78.47	0.000	82.00	Excav. to elev. 75.75 on PASSIVE side
12	No calculation at this stage				Install strut no.4 at elev. 76.00
13	0.009	78.47	0.000	82.00	Apply surcharge no.4 at elev. 75.75
14	No calculation at this stage				Install strut no.5 at elev. 79.50
15	0.010	78.47	0.000	82.00	Remove strut no.3 at elev. 78.00
16	No calculation at this stage				Install strut no.6 at elev. 78.95
17	0.010	78.47	0.000	82.00	Remove strut no.5 at elev. 79.50
18	No calculation at this stage				Install strut no.7 at elev. 81.75
19	0.010	78.47	0.000	82.00	Remove strut no.2 at elev. 81.10
20	0.010	78.00	0.000	82.00	Change soil type 1 to soil type 4
21	0.010	78.00	0.000	82.00	Change soil type 2 to soil type 5
22	0.010	78.00	0.000	82.00	Change soil type 3 to soil type 6

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

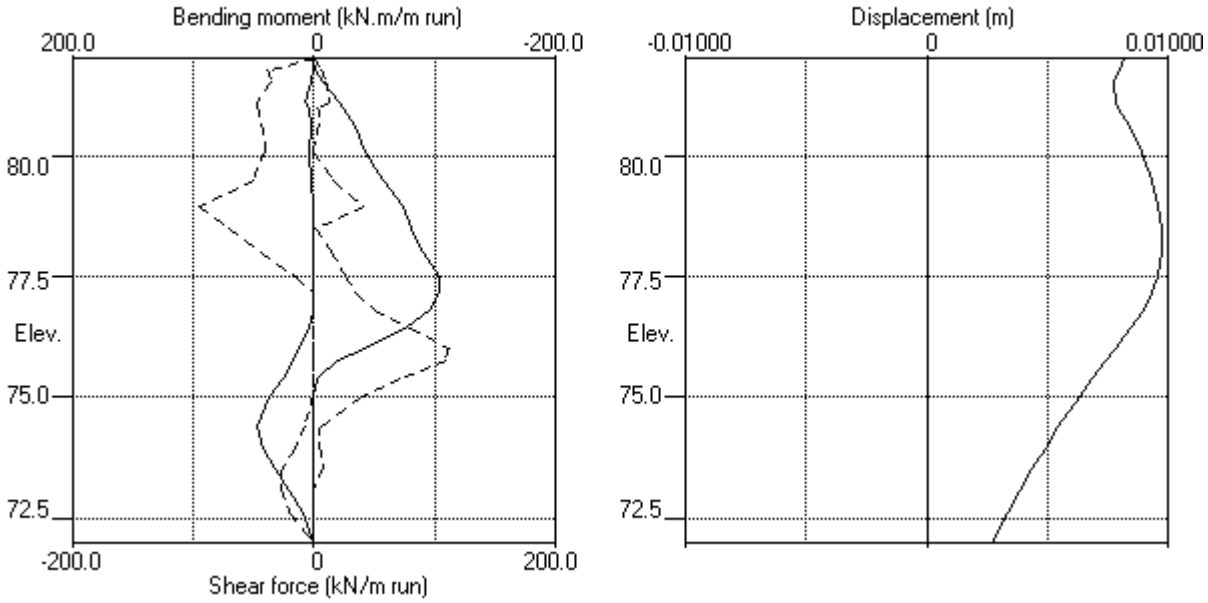
Stage no.	Strut no. 2 at elev. 81.10			Strut no. 3 at elev. 78.00			Strut no. 4 at elev. 76.00		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
8	60	179	241	---	---	---	---	---	---
10	59	178	241	0	1	1	---	---	---
11	51	154	207	48	145	196	---	---	---
13	57	171	231	30	91	123	slack	slack	slack
15	49	147	198	---	---	---	slack	slack	slack
17	54	162	218	---	---	---	slack	slack	slack
19	---	---	---	---	---	---	slack	slack	slack
20	---	---	---	---	---	---	slack	slack	slack
21	---	---	---	---	---	---	102	102	138
22	---	---	---	---	---	---	108	108	146

Stage no.	Strut no. 5 at elev. 79.50			Strut no. 6 at elev. 78.95			Strut no. 7 at elev. 81.75		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
15	29	88	119	---	---	---	---	---	---
17	---	---	---	25	25	34	---	---	---
19	---	---	---	43	43	58	39	39	52
20	---	---	---	135	135	183	42	42	57
21	---	---	---	127	127	171	42	42	57
22	---	---	---	120	120	162	43	43	58

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Soil types Passive side
1	82.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES (Unfactored SLS soil strengths)

No.	Soil type / Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type / Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	78.60	78.60	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	76.40	76.40	0.0	WC
5	1	81.00	81.00	0.0	1	75.75	75.75	0.0	MC
6	1	82.00	82.00	0.0	1	75.25	75.25	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 72.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	4.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	76.00	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.250000	2.000E+08	1.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	84.40	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	81.50	1.30(A)	0.50	20.00	100.00	=	N/A	1.00 P/U
2	81.50	0.80(A)	20.00	0.50	80.00	=	N/A	1.00 P/U
3	82.00	0.00(A)	20.00	20.00	5.00	=	N/A	1.30 Var
4	75.75	-0.00(P)	8.00	10.00	52.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 81.50
2	Apply surcharge no.2 at elevation 81.50
3	Apply surcharge no.3 at elevation 82.00
4	Apply water pressure profile no.2 (Worst Cred.)
5	Excavate to elevation 80.60 on PASSIVE side
6	Install strut or anchor no.2 at elevation 81.10
7	Apply water pressure profile no.4 (Worst Cred.) No analysis at this stage
8	Excavate to elevation 77.50 on PASSIVE side
9	Install strut or anchor no.3 at elevation 78.00
10	Apply water pressure profile no.6 (Worst Cred.)
11	Excavate to elevation 75.75 on PASSIVE side
12	Install strut or anchor no.4 at elevation 76.00
13	Apply surcharge no.4 at elevation 75.75
14	Install strut or anchor no.5 at elevation 79.50
15	Remove strut or anchor no.3 at elevation 78.00
16	Install strut or anchor no.6 at elevation 78.95
17	Remove strut or anchor no.5 at elevation 79.50
18	Install strut or anchor no.7 at elevation 81.75
19	Remove strut or anchor no.2 at elevation 81.10
20	Change properties of soil type 1 to soil type 4 Ko pressures will be reset
21	Change properties of soil type 2 to soil type 5 Ko pressures will be reset
22	Change properties of soil type 3 to soil type 6 Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 2
Water pressures : Worst Credible
Partial factor on C' = 1.250
Partial factor on Phi' = 1.250
Partial factor on Cu = 1.400
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.300

Stability analysis:
Method of analysis - Strength Factor method
Overall factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 81.50	No	No	No
2	Apply surcharge no.2 at elev. 81.50	No	No	No
3	Apply surcharge no.3 at elev. 82.00	No	No	No
4	Apply water pressure profile no.2	No	No	No
5	Excav. to elev. 80.60 on PASSIVE side	No	No	No
6	Install strut no.2 at elev. 81.10	No	No	No
7	Apply water pressure profile no.4	No	No	No
8	Excav. to elev. 77.50 on PASSIVE side	No	No	No
9	Install strut no.3 at elev. 78.00	No	No	No
10	Apply water pressure profile no.6	No	No	No
11	Excav. to elev. 75.75 on PASSIVE side	No	No	No
12	Install strut no.4 at elev. 76.00	No	No	No
13	Apply surcharge no.4 at elev. 75.75	No	No	No
14	Install strut no.5 at elev. 79.50	No	No	No
15	Remove strut no.3 at elev. 78.00	No	No	No
16	Install strut no.6 at elev. 78.95	No	No	No
17	Remove strut no.5 at elev. 79.50	No	No	No
18	Install strut no.7 at elev. 81.75	No	No	No
19	Remove strut no.2 at elev. 81.10	No	No	No
20	Change soil type 1 to soil type 4	No	No	No
21	Change soil type 2 to soil type 5	No	No	No
22	Change soil type 3 to soil type 6	Yes	No	Yes
*	Summary output	Yes	-	Yes

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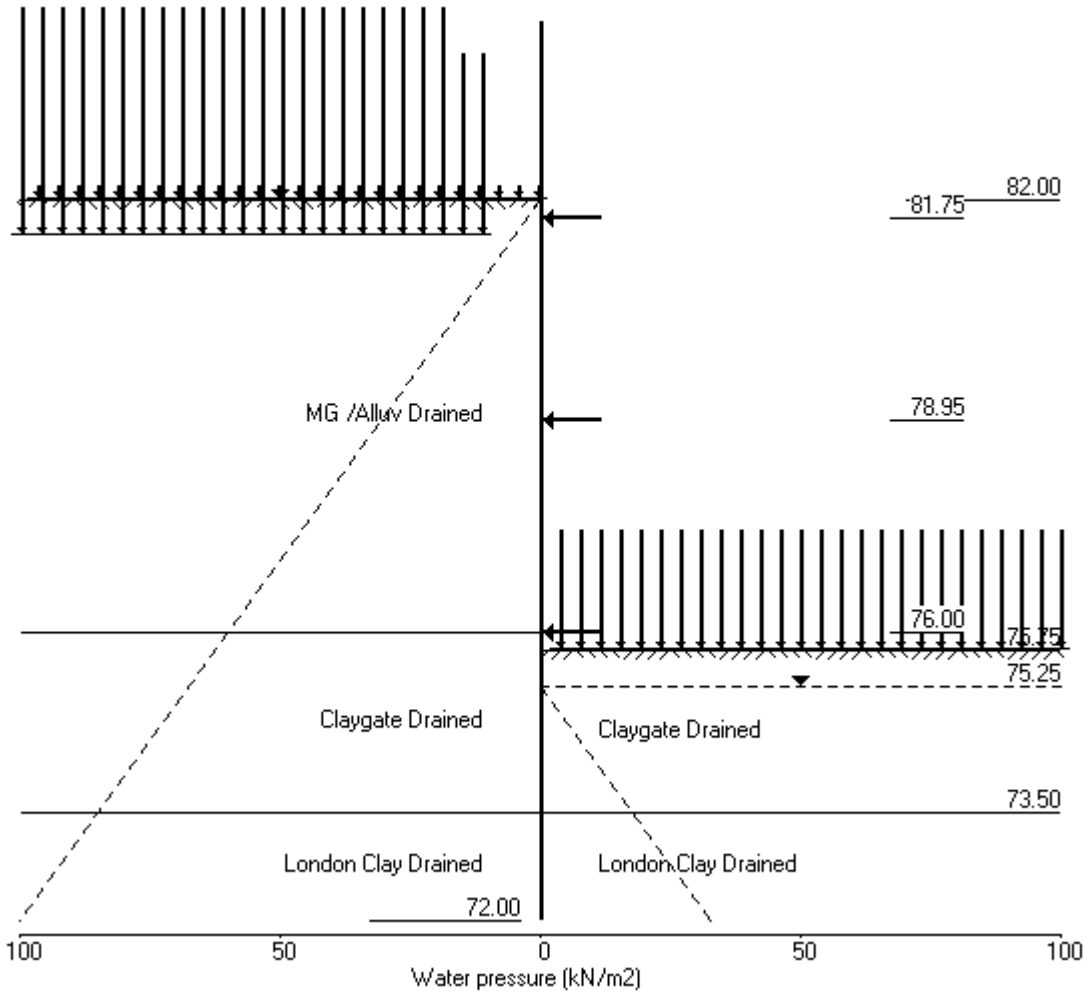
Units: kN,m

Stage No.22 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 22 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
22	82.00	75.75		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall
Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	82.00	17.95	0.007	-1.76E-03	0.0	0.0	
2	81.75	22.25	0.007	-1.76E-03	5.0	0.8	55.2
		22.25	0.007	-1.76E-03	-50.2	0.8	
3	81.50	11.90	0.007	-1.75E-03	-45.9	-11.1	
4	81.10	16.56	0.008	-1.67E-03	-40.2	-28.1	
5	81.00	18.77	0.008	-1.63E-03	-38.5	-32.1	
6	80.60	28.10	0.009	-1.47E-03	-29.1	-45.7	
7	80.05	38.70	0.010	-1.17E-03	-10.7	-56.1	
8	79.50	46.88	0.010	-8.47E-04	12.8	-56.0	
9	78.95	53.94	0.011	-5.61E-04	40.5	-41.7	125.3
		53.94	0.011	-5.61E-04	-84.7	-41.7	
10	78.60	58.18	0.011	-3.56E-04	-65.1	-68.0	
11	78.00	65.29	0.011	1.68E-04	-28.1	-96.5	
12	77.50	71.16	0.011	6.97E-04	6.1	-102.4	
13	76.95	77.62	0.010	1.25E-03	47.0	-88.2	
14	76.40	84.04	0.009	1.66E-03	91.4	-50.7	
15	76.00	88.64	0.008	1.78E-03	126.0	-7.4	117.1
		117.54	0.008	1.78E-03	8.8	-7.4	
16	75.75	120.48	0.008	1.79E-03	38.6	-1.6	
		-19.06	0.008	1.79E-03	38.6	-1.6	
17	75.25	-36.80	0.007	1.76E-03	24.6	15.3	
18	74.83	-29.10	0.006	1.67E-03	10.6	22.1	
19	74.40	-21.42	0.006	1.57E-03	-0.1	23.7	
20	73.95	-13.47	0.005	1.46E-03	-8.0	21.2	
21	73.50	-5.70	0.004	1.37E-03	-12.3	15.9	
		0.49	0.004	1.37E-03	-12.3	15.9	
22	73.05	0.92	0.004	1.31E-03	-12.0	10.5	
23	72.60	9.63	0.003	1.27E-03	-9.6	4.9	
24	72.00	22.33	0.002	1.25E-03	0.0	0.0	

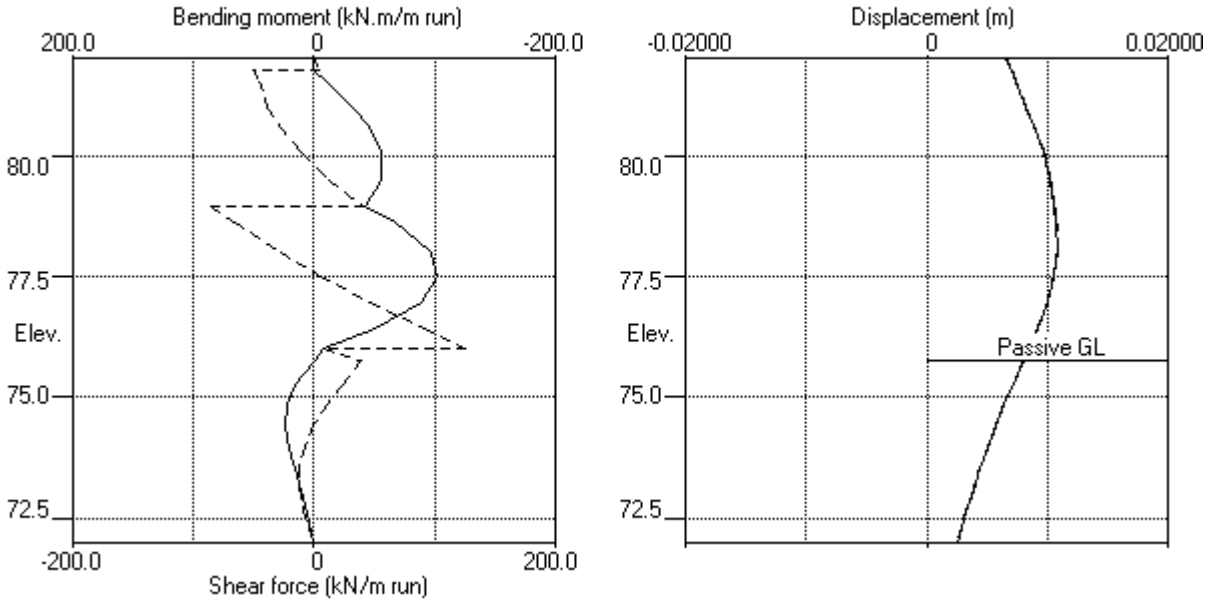
At elev. 81.75 Strut force = 55.2 kN/strut = 55.2 kN/m run
At elev. 78.95 Strut force = 125.3 kN/strut = 125.3 kN/m run
At elev. 76.00 Strut force = 117.1 kN/strut = 117.1 kN/m run

(continued)

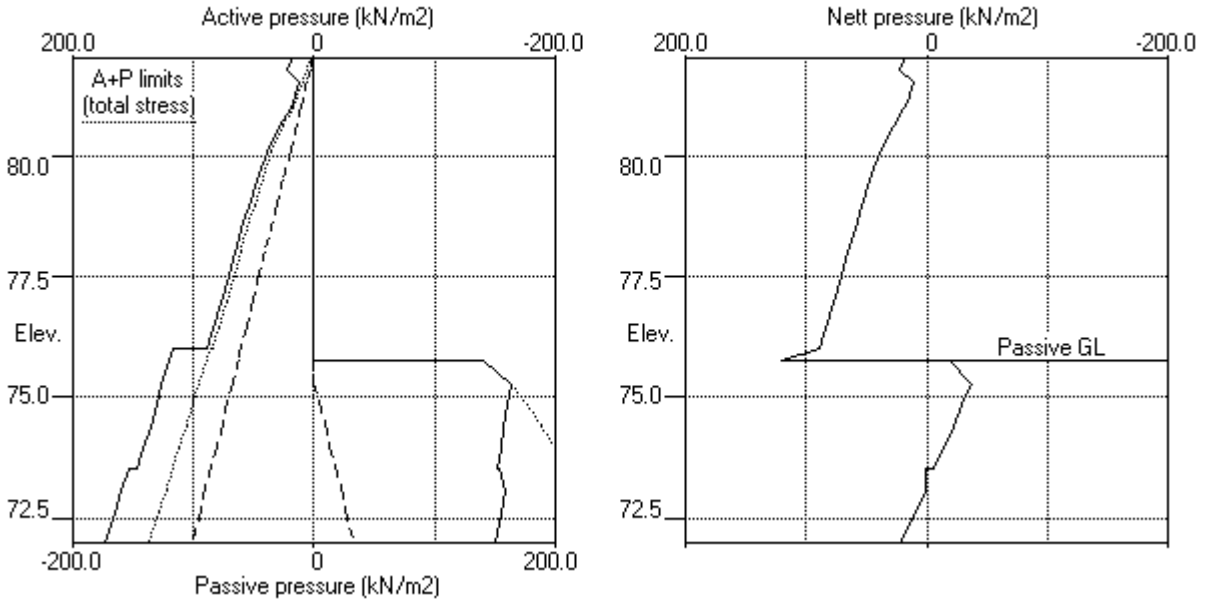
Stage No.22 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Units: kN,m

Stage No.22 Change soil type 3 to soil type 6



Stage No.22 Change soil type 3 to soil type 6



Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: ULS DA1 Combination 2
Water pressures : Worst Credible
Partial factor on C' = 1.250
Partial factor on Phi' = 1.250
Partial factor on Cu = 1.400
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.300

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	G.L. Act.	G.L. Pass.	Strut Elev.	Overall FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
1	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
2	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
3	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
4	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
5	82.00	80.60	Cant.	2.271	73.39	80.13	0.47
6	82.00	80.60		No analysis at this stage			
7	82.00	80.60		No analysis at this stage			
8	82.00	77.50	81.10	1.718	n/a	75.57	1.93
9	82.00	77.50		No analysis at this stage			

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 2

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement maximum m	Displacement minimum m	Bending moment maximum kN.m/m	Bending moment minimum kN.m/m	Shear force maximum kN/m	Shear force minimum kN/m
1	82.00	0.008	0.000	0.0	-0.0	0.0	0.0
2	81.75	0.008	0.000	1.1	-0.2	7.2	-50.2
3	81.50	0.008	0.000	3.5	-11.1	11.3	-45.9
4	81.10	0.008	0.000	9.0	-28.1	14.8	-58.9
5	81.00	0.008	0.000	4.8	-32.1	2.5	-58.4
6	80.60	0.009	0.000	2.3	-45.7	4.9	-56.0
7	80.05	0.010	0.000	3.9	-56.1	0.0	-50.7
8	79.50	0.010	0.000	1.7	-74.5	14.1	-67.8
9	78.95	0.011	0.000	0.0	-93.4	41.8	-98.8
10	78.60	0.011	0.000	0.0	-100.6	1.0	-79.2
11	78.00	0.011	0.000	0.0	-115.2	20.9	-42.2
12	77.50	0.011	0.000	0.0	-120.5	34.6	-15.9
13	76.95	0.010	0.000	0.0	-114.1	50.7	0.0
14	76.40	0.009	0.000	4.3	-84.3	91.4	0.0
15	76.00	0.008	0.000	12.0	-46.6	126.0	0.0
16	75.75	0.008	0.000	16.8	-21.5	121.5	0.0
17	75.25	0.007	0.000	36.7	0.0	66.8	0.0
18	74.83	0.006	0.000	49.3	0.0	29.0	-2.3
19	74.40	0.006	0.000	54.2	0.0	5.5	-8.0
20	73.95	0.005	0.000	48.9	0.0	2.0	-20.2
21	73.50	0.004	0.000	36.6	0.0	3.8	-30.4
22	73.05	0.004	0.000	22.8	0.0	0.0	-30.6
23	72.60	0.003	0.000	9.6	0.0	0.0	-23.7
24	72.00	0.002	0.000	0.0	-0.0	0.0	-0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment				Shear force			
no.	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	1.5	74.40	-4.7	78.60	3.4	76.00	-2.2	80.05
2	7.3	74.83	-15.9	78.95	11.7	76.00	-8.9	80.60
3	10.2	74.83	-18.1	78.60	15.5	76.00	-9.7	80.60
4	9.8	74.83	-17.9	78.60	15.1	76.00	-9.6	80.60
5	21.6	74.83	-5.2	78.00	22.9	76.00	-10.3	73.50
6	No calculation at this stage							
7	No calculation at this stage							
8	44.1	74.83	-102.3	78.00	85.9	76.00	-58.9	81.10
9	No calculation at this stage							
10	43.9	74.83	-102.1	78.00	85.8	76.00	-58.8	81.10
11	33.3	74.40	-85.2	76.95	86.6	75.75	-49.0	81.10
12	No calculation at this stage							
13	48.7	74.40	-98.6	77.50	104.6	75.75	-55.0	81.10
14	No calculation at this stage							
15	53.5	74.40	-117.7	77.50	113.7	75.75	-67.8	79.50
16	No calculation at this stage							
17	52.7	74.40	-114.3	77.50	112.1	75.75	-55.3	78.95
18	No calculation at this stage							
19	51.8	74.40	-109.9	77.50	110.1	75.75	-58.4	78.95
20	54.2	74.40	-120.5	77.50	121.5	75.75	-98.8	78.95
21	14.5	73.50	-107.1	77.50	120.0	76.00	-90.3	78.95
22	23.7	74.40	-102.4	77.50	126.0	76.00	-84.7	78.95

Maximum and minimum displacement at each stage

Stage	Displacement				Stage description
no.	maximum m	elev.	minimum m	elev.	
1	0.000	78.60	0.000	82.00	Apply surcharge no.1 at elev. 81.50
2	0.002	79.50	0.000	82.00	Apply surcharge no.2 at elev. 81.50
3	0.003	79.50	0.000	82.00	Apply surcharge no.3 at elev. 82.00
4	0.003	79.50	0.000	82.00	Apply water pressure profile no.2
5	0.008	82.00	0.000	82.00	Excav. to elev. 80.60 on PASSIVE side
6	No calculation at this stage				Install strut no.2 at elev. 81.10
7	No calculation at this stage				Apply water pressure profile no.4
8	0.010	78.60	0.000	82.00	Excav. to elev. 77.50 on PASSIVE side
9	No calculation at this stage				Install strut no.3 at elev. 78.00
10	0.010	78.60	0.000	82.00	Apply water pressure profile no.6
11	0.011	78.00	0.000	82.00	Excav. to elev. 75.75 on PASSIVE side
12	No calculation at this stage				Install strut no.4 at elev. 76.00
13	0.010	78.60	0.000	82.00	Apply surcharge no.4 at elev. 75.75
14	No calculation at this stage				Install strut no.5 at elev. 79.50
15	0.011	78.00	0.000	82.00	Remove strut no.3 at elev. 78.00
16	No calculation at this stage				Install strut no.6 at elev. 78.95
17	0.011	78.00	0.000	82.00	Remove strut no.5 at elev. 79.50
18	No calculation at this stage				Install strut no.7 at elev. 81.75
19	0.011	78.60	0.000	82.00	Remove strut no.2 at elev. 81.10
20	0.011	78.00	0.000	82.00	Change soil type 1 to soil type 4
21	0.011	78.00	0.000	82.00	Change soil type 2 to soil type 5
22	0.011	78.00	0.000	82.00	Change soil type 3 to soil type 6

Summary of results (continued)

Strut forces at each stage (horizontal components)

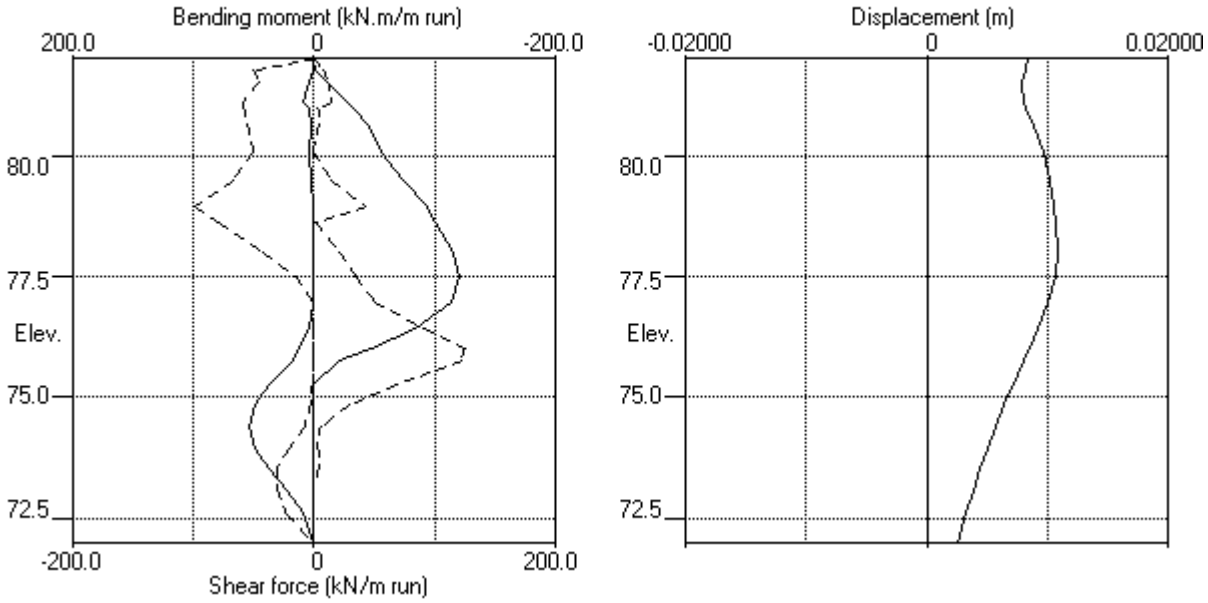
Stage no.	Strut no. 2 at elev. 81.10		Strut no. 3 at elev. 78.00		Strut no. 4 at elev. 76.00	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
8	73.00	219.01	---	---	---	---
10	72.95	218.86	0.15	0.45	---	---
11	63.34	190.03	61.13	183.38	---	---
13	69.35	208.06	43.54	130.61	slack	slack
15	57.21	171.63	---	---	slack	slack
17	64.76	194.28	---	---	slack	slack
19	---	---	---	---	slack	slack
20	---	---	---	---	slack	slack
21	---	---	---	---	110.56	110.56
22	---	---	---	---	117.12	117.12

Stage no.	Strut no. 5 at elev. 79.50		Strut no. 6 at elev. 78.95		Strut no. 7 at elev. 81.75	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
15	43.71	131.12	---	---	---	---
17	---	---	38.03	38.03	---	---
19	---	---	59.21	59.21	46.68	46.68
20	---	---	140.27	140.27	54.40	54.40
21	---	---	132.13	132.13	54.05	54.05
22	---	---	125.26	125.26	55.22	55.22

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	82.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES

No.	Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	78.60	78.60	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	76.40	76.40	0.0	WC
5	1	81.00	81.00	0.0	1	74.45	74.45	0.0	MC
6	1	82.00	82.00	0.0	1	73.95	73.95	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 72.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	4.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	74.60	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.250000	2.000E+08	1.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	84.40	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	81.50	1.30(A)	0.50	20.00	100.00	=	N/A	1.00 P/U
2	81.50	0.80(A)	20.00	0.50	80.00	=	N/A	1.00 P/U
3	82.00	0.00(A)	20.00	20.00	5.00	=	N/A	1.00 Var
4	74.45	-0.00(P)	8.00	10.00	65.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.3 at elevation 82.00
2	Apply water pressure profile no.1 (Mod. Conserv.)
3	Excavate to elevation 80.60 on PASSIVE side
4	Install strut or anchor no.2 at elevation 81.10
5	Apply water pressure profile no.3 (Mod. Conserv.) No analysis at this stage
6	Excavate to elevation 77.50 on PASSIVE side
7	Install strut or anchor no.3 at elevation 78.00
8	Apply water pressure profile no.5 (Mod. Conserv.)
9	Excavate to elevation 74.45 on PASSIVE side
10	Install strut or anchor no.4 at elevation 74.60
11	Apply surcharge no.4 at elevation 74.45
12	Install strut or anchor no.5 at elevation 79.50
13	Remove strut or anchor no.3 at elevation 78.00
14	Install strut or anchor no.6 at elevation 78.95
15	Remove strut or anchor no.5 at elevation 79.50
16	Install strut or anchor no.7 at elevation 81.75
17	Remove strut or anchor no.2 at elevation 81.10
18	Change properties of soil type 1 to soil type 4 Ko pressures will be reset
19	Change properties of soil type 2 to soil type 5 Ko pressures will be reset
20	Change properties of soil type 3 to soil type 6 Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: Serviceability Limit State
All loads and soil strengths are unfactored

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom., Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.3 at elev. 82.00	No	No	No
2	Apply water pressure profile no.1	No	No	No
3	Excav. to elev. 80.60 on PASSIVE side	No	No	No
4	Install strut no.2 at elev. 81.10	No	No	No
5	Apply water pressure profile no.3	No	No	No
6	Excav. to elev. 77.50 on PASSIVE side	No	No	No
7	Install strut no.3 at elev. 78.00	No	No	No
8	Apply water pressure profile no.5	No	No	No
9	Excav. to elev. 74.45 on PASSIVE side	No	No	No
10	Install strut no.4 at elev. 74.60	No	No	No
11	Apply surcharge no.4 at elev. 74.45	No	No	No
12	Install strut no.5 at elev. 79.50	No	No	No
13	Remove strut no.3 at elev. 78.00	No	No	No
14	Install strut no.6 at elev. 78.95	No	No	No
15	Remove strut no.5 at elev. 79.50	No	No	No
16	Install strut no.7 at elev. 81.75	No	No	No
17	Remove strut no.2 at elev. 81.10	No	No	No
18	Change soil type 1 to soil type 4	No	No	No
19	Change soil type 2 to soil type 5	No	No	No
20	Change soil type 3 to soil type 6	Yes	No	Yes
*	Summary output	Yes	-	Yes

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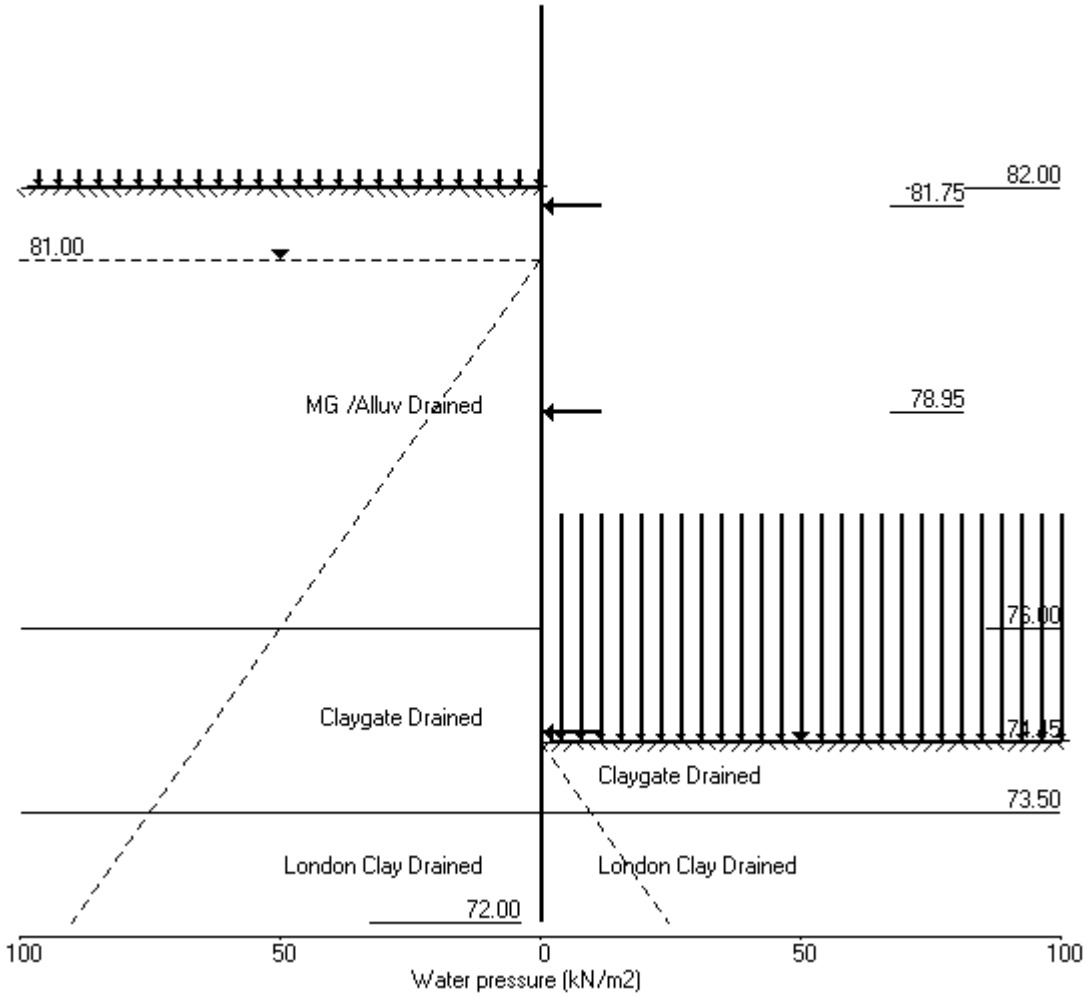
Units: kN,m

Stage No.20 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 20 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
20	82.00	74.45		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall
Limit State: Serviceability Limit State
Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	82.00	17.30	0.004	-1.03E-03	0.0	0.0	
2	81.75	17.54	0.004	-1.03E-03	4.4	0.6	8.2
		17.54	0.004	-1.03E-03	-3.9	0.6	
3	81.43	8.61	0.005	-1.03E-03	0.4	0.3	
4	81.10	10.41	0.005	-1.03E-03	3.5	1.0	
5	81.00	11.30	0.005	-1.03E-03	4.6	1.4	
6	80.60	16.81	0.005	-1.04E-03	10.2	4.3	
7	80.05	24.31	0.006	-1.09E-03	21.5	12.8	
8	79.50	31.63	0.007	-1.22E-03	36.9	29.2	
9	78.95	38.64	0.007	-1.46E-03	56.2	54.5	195.0
		38.64	0.007	-1.46E-03	-138.8	54.5	
10	78.47	44.57	0.008	-1.58E-03	-119.1	-6.3	
11	78.00	50.41	0.009	-1.42E-03	-96.5	-57.5	
12	77.50	56.58	0.009	-1.01E-03	-69.8	-99.2	
13	77.15	60.97	0.010	-6.02E-04	-49.2	-120.0	
14	76.80	65.45	0.010	-1.30E-04	-27.1	-133.4	
15	76.40	70.71	0.010	4.49E-04	0.2	-139.0	
16	76.00	76.11	0.009	1.02E-03	29.5	-133.2	
		104.82	0.009	1.02E-03	29.5	-133.2	
17	75.65	111.11	0.009	1.49E-03	67.3	-116.5	
18	75.30	117.52	0.008	1.87E-03	107.3	-86.0	
19	74.95	123.93	0.008	2.10E-03	149.6	-41.2	
20	74.60	130.15	0.007	2.14E-03	194.0	19.5	190.5
		130.15	0.007	2.14E-03	3.6	19.5	
21	74.45	132.53	0.007	2.11E-03	23.3	21.4	
		-52.50	0.007	2.11E-03	23.3	21.4	
22	73.97	-36.39	0.006	1.99E-03	2.1	26.1	
23	73.50	-20.53	0.005	1.87E-03	-11.4	22.5	
		-14.78	0.005	1.87E-03	-11.4	22.5	

(continued)

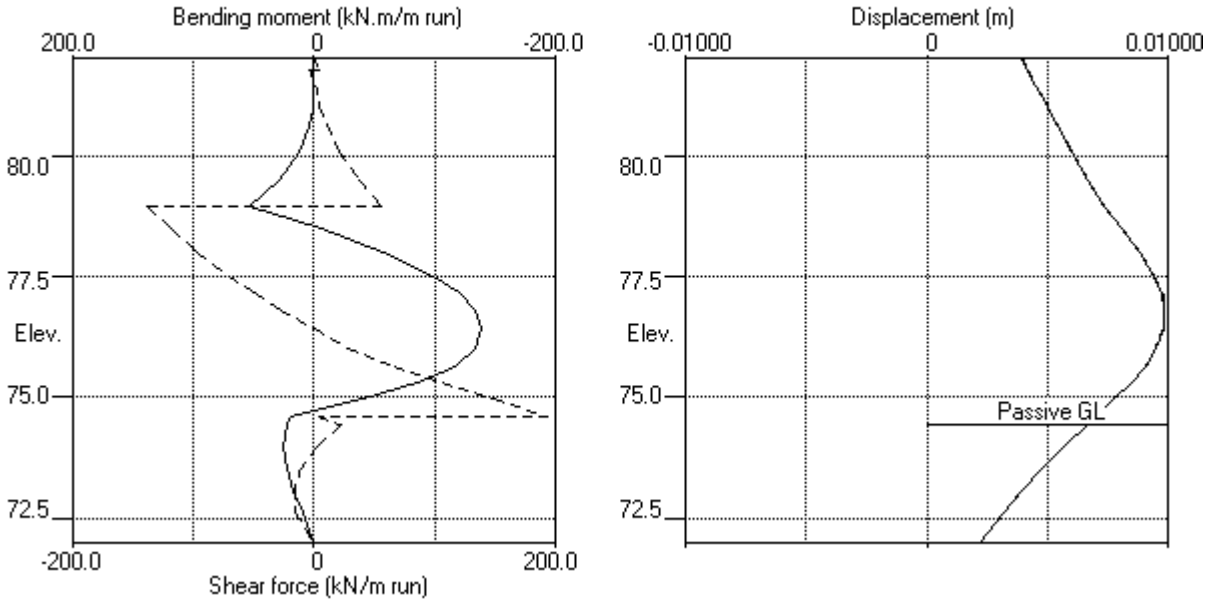
Stage No.20 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
24	73.05	-5.89	0.004	1.77E-03	-16.0	16.9	
25	72.60	10.44	0.003	1.71E-03	-15.0	8.6	
26	72.00	39.57	0.002	1.69E-03	0.0	-0.0	

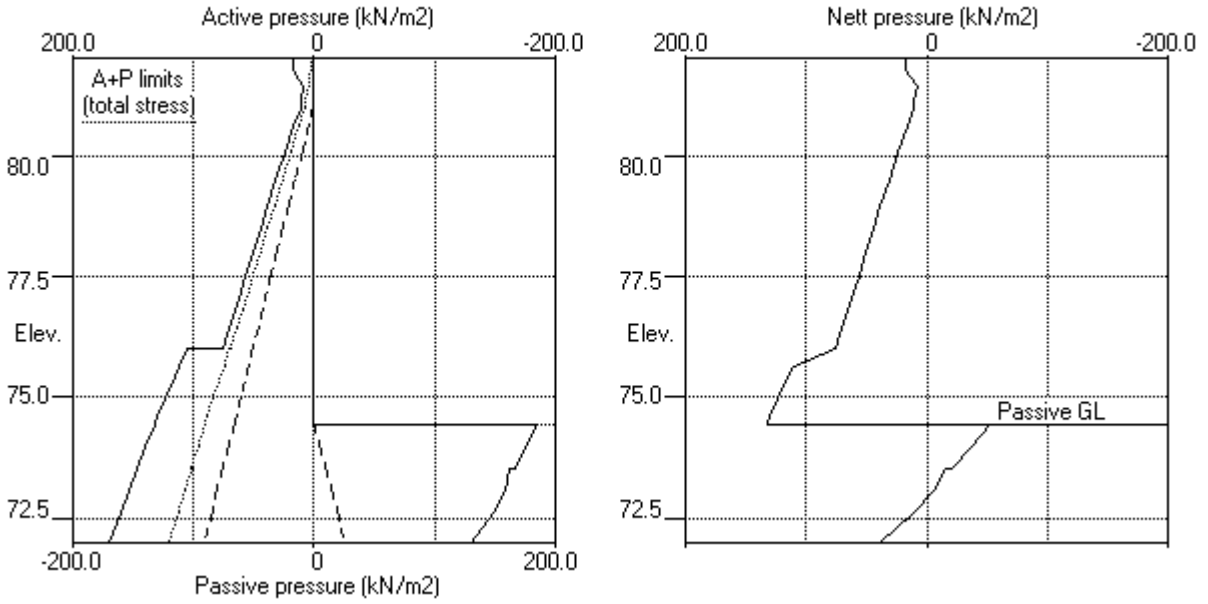
At elev. 81.75 Strut force = 8.2 kN/strut = 8.2 kN/m run
At elev. 78.95 Strut force = 195.0 kN/strut = 195.0 kN/m run
At elev. 74.60 Strut force = 190.5 kN/strut = 190.5 kN/m run

Units: kN,m

Stage No.20 Change soil type 3 to soil type 6



Stage No.20 Change soil type 3 to soil type 6



Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: Serviceability Limit State

All loads and soil strengths are unfactored

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	G.L. Act.	G.L. Pass.	Strut Elev.	FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
1	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
2	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
3	82.00	80.60	Cant.	5.070	73.22	80.33	0.27
4	82.00	80.60		No analysis at this stage			
5	82.00	80.60		No analysis at this stage			
6	82.00	77.50	81.10	2.799	n/a	76.90	0.60
7	82.00	77.50		No analysis at this stage			

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment Calculated		Bending moment Factored		Shear force Calculated		Shear force Factored	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
		m	m	kN.m/m		kN.m/m		kN/m	kN/m	kN/m	kN/m
1	82.00	0.005	0.000	0	0	0	0	0	0	0	0
2	81.75	0.005	0.000	1	-0	1	-0	5	-11	7	-15
3	81.43	0.005	0.000	3	-2	5	-3	10	-7	13	-10
4	81.10	0.005	0.000	7	-4	9	-5	12	-39	16	-53
5	81.00	0.005	0.000	8	-4	10	-6	6	-39	9	-53
6	80.60	0.006	0.000	10	-12	14	-17	12	-36	16	-49
7	80.05	0.006	0.000	16	-31	22	-42	23	-32	32	-43
8	79.50	0.007	0.000	33	-47	45	-63	39	-71	52	-95
9	78.95	0.007	0.000	60	-59	81	-80	58	-144	79	-194
10	78.47	0.008	0.000	0	-65	0	-88	12	-124	16	-167
11	78.00	0.009	0.000	0	-67	0	-91	22	-102	30	-137
12	77.50	0.010	0.000	0	-101	0	-137	17	-75	23	-101
13	77.15	0.010	0.000	0	-124	0	-167	24	-54	32	-73
14	76.80	0.010	0.000	0	-139	0	-188	32	-32	43	-44
15	76.40	0.010	0.000	2	-147	3	-198	43	-14	58	-19
16	76.00	0.010	0.000	7	-143	10	-194	56	0	76	0
17	75.65	0.009	0.000	11	-129	15	-174	67	0	91	0
18	75.30	0.009	0.000	15	-100	21	-136	107	0	145	0
19	74.95	0.008	0.000	21	-60	29	-81	150	-0	202	-0
20	74.60	0.007	0.000	24	-37	32	-51	194	-3	262	-4
21	74.45	0.007	0.000	24	-28	32	-38	95	-4	129	-5
22	73.97	0.006	0.000	26	-7	35	-10	42	-9	57	-12
23	73.50	0.005	0.000	23	0	31	0	11	-13	15	-17
24	73.05	0.005	0.000	21	0	28	0	0	-16	0	-22
25	72.60	0.004	0.000	11	0	15	0	0	-20	0	-27
26	72.00	0.003	0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment				Shear force					
	Calculated				Factored		Calculated				Factored	
no.	max.	elev.	min.	elev.	max.	min.	max.	elev.	min.	elev.	max.	min.
	kN.m/m		kN.m/m		kN.m/m		kN/m		kN/m		kN/m	kN/m
1	2	74.95	-2	78.00	3	-2	3	76.00	-1	73.50	4	-1
2	2	74.95	-2	78.00	3	-2	3	76.00	-1	73.50	4	-1
3	13	74.95	-3	77.50	18	-3	14	76.00	-6	73.50	19	-9
4	No calculation at this stage											
5	No calculation at this stage											
6	24	74.45	-67	78.00	32	-91	56	76.00	-39	81.10	76	-53
7	No calculation at this stage											
8	24	74.45	-67	78.00	32	-90	56	76.00	-39	81.10	76	-53
9	7	81.10	-75	76.00	9	-102	60	74.45	-69	78.00	81	-93
10	No calculation at this stage											
11	11	73.05	-85	76.00	15	-115	77	74.45	-70	78.00	105	-94
12	No calculation at this stage											
13	26	79.50	-100	76.40	35	-135	84	74.45	-71	79.50	113	-95
14	No calculation at this stage											
15	16	73.50	-97	76.40	22	-131	83	74.45	-67	78.95	111	-91
16	No calculation at this stage											
17	16	73.50	-96	76.40	21	-130	82	74.45	-68	78.95	111	-92
18	46	78.95	-127	76.40	62	-171	95	74.45	-131	78.95	129	-177
19	60	78.95	-147	76.40	81	-198	187	74.60	-144	78.95	253	-194
20	55	78.95	-139	76.40	74	-188	194	74.60	-139	78.95	262	-187

Maximum and minimum displacement at each stage

Stage	Displacement				Stage description
no.	maximum	elev.	minimum	elev.	
	m		m		
1	0.001	82.00	0.000	82.00	Apply surcharge no.3 at elev. 82.00
2	0.001	82.00	0.000	82.00	Apply water pressure profile no.1
3	0.005	82.00	0.000	82.00	Excav. to elev. 80.60 on PASSIVE side
4	No calculation at this stage				Install strut no.2 at elev. 81.10
5	No calculation at this stage				Apply water pressure profile no.3
6	0.007	78.47	0.000	82.00	Excav. to elev. 77.50 on PASSIVE side
7	No calculation at this stage				Install strut no.3 at elev. 78.00
8	0.007	78.47	0.000	82.00	Apply water pressure profile no.5
9	0.008	76.40	0.000	82.00	Excav. to elev. 74.45 on PASSIVE side
10	No calculation at this stage				Install strut no.4 at elev. 74.60
11	0.008	76.80	0.000	82.00	Apply surcharge no.4 at elev. 74.45
12	No calculation at this stage				Install strut no.5 at elev. 79.50
13	0.009	76.80	0.000	82.00	Remove strut no.3 at elev. 78.00
14	No calculation at this stage				Install strut no.6 at elev. 78.95
15	0.009	76.80	0.000	82.00	Remove strut no.5 at elev. 79.50
16	No calculation at this stage				Install strut no.7 at elev. 81.75
17	0.009	76.80	0.000	82.00	Remove strut no.2 at elev. 81.10
18	0.010	76.80	0.000	82.00	Change soil type 1 to soil type 4
19	0.010	76.80	0.000	82.00	Change soil type 2 to soil type 5
20	0.010	76.80	0.000	82.00	Change soil type 3 to soil type 6

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

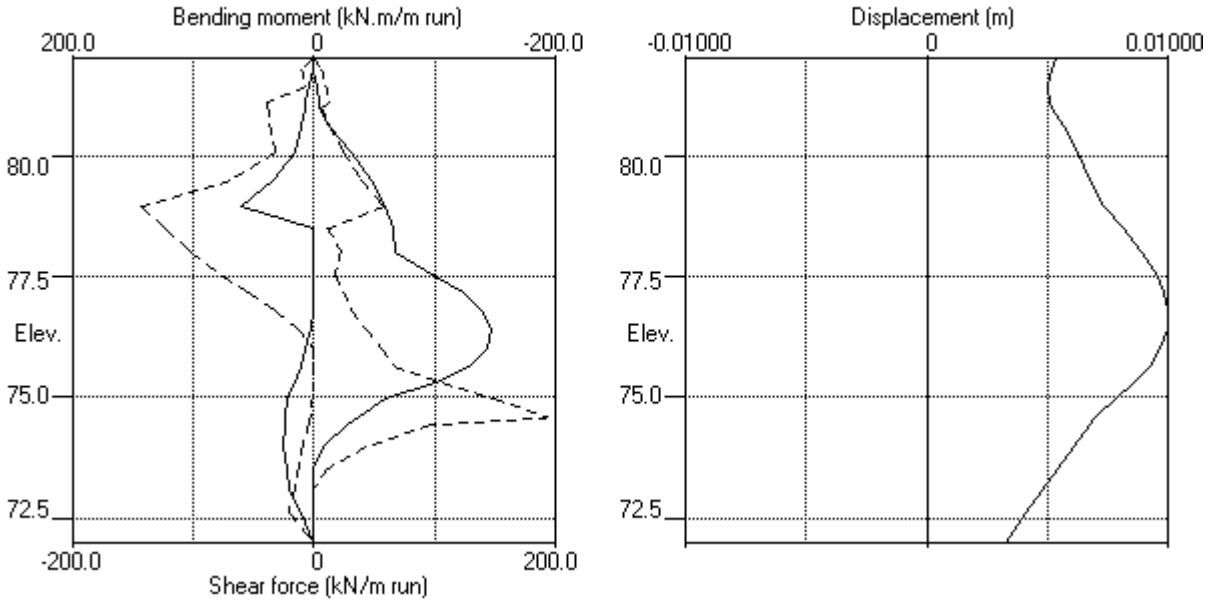
Stage no.	Strut no. 2 at elev. 81.10			Strut no. 3 at elev. 78.00			Strut no. 4 at elev. 74.60		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
6	50	151	203	---	---	---	---	---	---
8	50	150	203	0	1	1	---	---	---
9	31	94	126	91	272	368	---	---	---
11	34	101	137	89	267	361	slack	slack	slack
13	7	22	30	---	---	---	slack	slack	slack
15	23	70	95	---	---	---	slack	slack	slack
17	---	---	---	---	---	---	slack	slack	slack
18	---	---	---	---	---	---	slack	slack	slack
19	---	---	---	---	---	---	169	169	228
20	---	---	---	---	---	---	190	190	257

Stage no.	Strut no. 5 at elev. 79.50			Strut no. 6 at elev. 78.95			Strut no. 7 at elev. 81.75		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
13	91	273	369	---	---	---	---	---	---
15	---	---	---	78	78	106	---	---	---
17	---	---	---	85	85	115	17	17	22
18	---	---	---	184	184	248	11	11	15
19	---	---	---	202	202	273	6	6	9
20	---	---	---	195	195	263	8	8	11

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	82.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES (Unfactored SLS soil strengths)

No.	Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type ------- Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	78.60	78.60	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	76.40	76.40	0.0	WC
5	1	81.00	81.00	0.0	1	74.45	74.45	0.0	MC
6	1	82.00	82.00	0.0	1	73.95	73.95	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 72.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	4.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	74.60	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.250000	2.000E+08	1.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	84.40	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	81.50	1.30(A)	0.50	20.00	100.00	=	N/A	1.00 P/U
2	81.50	0.80(A)	20.00	0.50	80.00	=	N/A	1.00 P/U
3	82.00	0.00(A)	20.00	20.00	5.00	=	N/A	1.10 Var
4	74.45	-0.00(P)	8.00	10.00	65.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.3 at elevation 82.00
2	Apply water pressure profile no.1 (Mod. Conserv.)
3	Excavate to elevation 80.60 on PASSIVE side
4	Install strut or anchor no.2 at elevation 81.10
5	Apply water pressure profile no.3 (Mod. Conserv.) No analysis at this stage
6	Excavate to elevation 77.50 on PASSIVE side
7	Install strut or anchor no.3 at elevation 78.00
8	Apply water pressure profile no.5 (Mod. Conserv.)
9	Excavate to elevation 74.45 on PASSIVE side
10	Install strut or anchor no.4 at elevation 74.60
11	Apply surcharge no.4 at elevation 74.45
12	Install strut or anchor no.5 at elevation 79.50
13	Remove strut or anchor no.3 at elevation 78.00
14	Install strut or anchor no.6 at elevation 78.95
15	Remove strut or anchor no.5 at elevation 79.50
16	Install strut or anchor no.7 at elevation 81.75
17	Remove strut or anchor no.2 at elevation 81.10
18	Change properties of soil type 1 to soil type 4 Ko pressures will be reset
19	Change properties of soil type 2 to soil type 5 Ko pressures will be reset
20	Change properties of soil type 3 to soil type 6 Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 1
Water pressures : Moderately Conservative
Partial factor on C' = 1.000
Partial factor on Phi' = 1.000
Partial factor on Cu = 1.000
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.100
Design factor on calculated Bending Moments = 1.350

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom., Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.3 at elev. 82.00	No	No	No
2	Apply water pressure profile no.1	No	No	No
3	Excav. to elev. 80.60 on PASSIVE side	No	No	No
4	Install strut no.2 at elev. 81.10	No	No	No
5	Apply water pressure profile no.3	No	No	No
6	Excav. to elev. 77.50 on PASSIVE side	No	No	No
7	Install strut no.3 at elev. 78.00	No	No	No
8	Apply water pressure profile no.5	No	No	No
9	Excav. to elev. 74.45 on PASSIVE side	No	No	No
10	Install strut no.4 at elev. 74.60	No	No	No
11	Apply surcharge no.4 at elev. 74.45	No	No	No
12	Install strut no.5 at elev. 79.50	No	No	No
13	Remove strut no.3 at elev. 78.00	No	No	No
14	Install strut no.6 at elev. 78.95	No	No	No
15	Remove strut no.5 at elev. 79.50	No	No	No
16	Install strut no.7 at elev. 81.75	No	No	No
17	Remove strut no.2 at elev. 81.10	No	No	No
18	Change soil type 1 to soil type 4	No	No	No
19	Change soil type 2 to soil type 5	No	No	No
20	Change soil type 3 to soil type 6	Yes	No	Yes
*	Summary output	Yes	-	Yes

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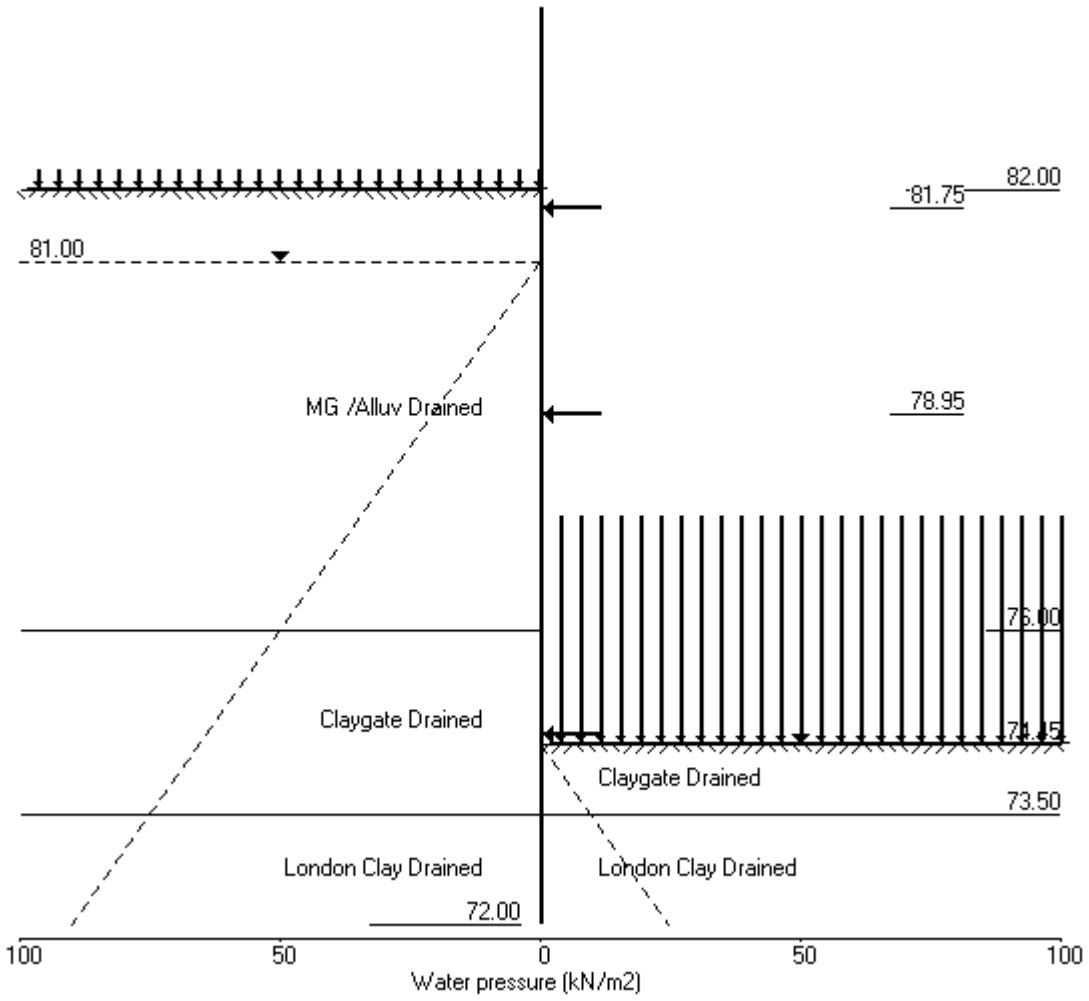
Units: kN,m

Stage No.20 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 20 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	82.00	19.11	0.004	-1.02E-03	0.0	0.0	
2	81.75	17.58	0.004	-1.02E-03	4.6	0.7	8.7
		17.58	0.004	-1.02E-03	-4.1	0.7	
3	81.43	8.63	0.005	-1.02E-03	0.2	0.3	
4	81.10	10.66	0.005	-1.02E-03	3.3	0.9	
5	81.00	11.54	0.005	-1.02E-03	4.4	1.3	
6	80.60	17.06	0.005	-1.04E-03	10.2	4.2	
7	80.05	24.56	0.006	-1.09E-03	21.6	13.3	
8	79.50	31.88	0.007	-1.21E-03	37.1	29.2	
9	78.95	38.89	0.007	-1.46E-03	56.6	54.7	195.9
		38.89	0.007	-1.46E-03	-139.3	54.7	
10	78.47	44.82	0.008	-1.58E-03	-119.4	-6.4	
11	78.00	50.65	0.009	-1.42E-03	-96.8	-57.7	
12	77.50	56.82	0.009	-1.00E-03	-69.9	-99.5	
13	77.15	61.21	0.010	-5.93E-04	-49.2	-120.4	
14	76.80	65.69	0.010	-1.19E-04	-27.0	-133.8	
15	76.40	70.94	0.010	4.62E-04	0.3	-139.3	
16	76.00	76.35	0.010	1.04E-03	29.8	-133.5	
		105.28	0.010	1.04E-03	29.8	-133.5	
17	75.65	111.57	0.009	1.50E-03	67.7	-116.7	
18	75.30	117.98	0.008	1.88E-03	107.9	-86.0	
19	74.95	124.39	0.008	2.12E-03	150.3	-41.0	
20	74.60	130.60	0.007	2.16E-03	194.9	19.9	191.6
		130.60	0.007	2.16E-03	3.3	19.9	
21	74.45	132.97	0.007	2.12E-03	23.1	21.9	
		-52.63	0.007	2.12E-03	23.1	21.9	
22	73.97	-36.45	0.006	2.00E-03	1.9	26.4	
23	73.50	-20.52	0.005	1.88E-03	-11.6	22.7	
		-14.40	0.005	1.88E-03	-11.6	22.7	
24	73.05	-5.81	0.004	1.78E-03	-16.2	17.0	
25	72.60	10.59	0.003	1.72E-03	-15.1	8.6	
26	72.00	39.78	0.002	1.69E-03	0.0	-0.0	

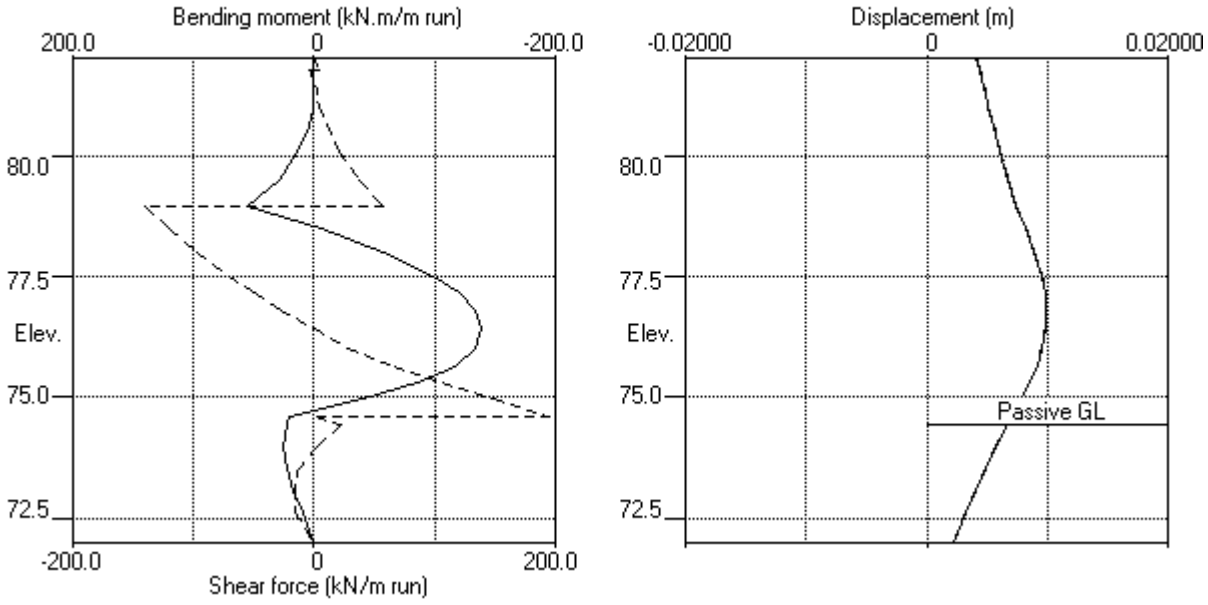
At elev. 81.75 Strut force = 8.7 kN/strut = 8.7 kN/m run
At elev. 78.95 Strut force = 195.9 kN/strut = 195.9 kN/m run
At elev. 74.60 Strut force = 191.6 kN/strut = 191.6 kN/m run

(continued)

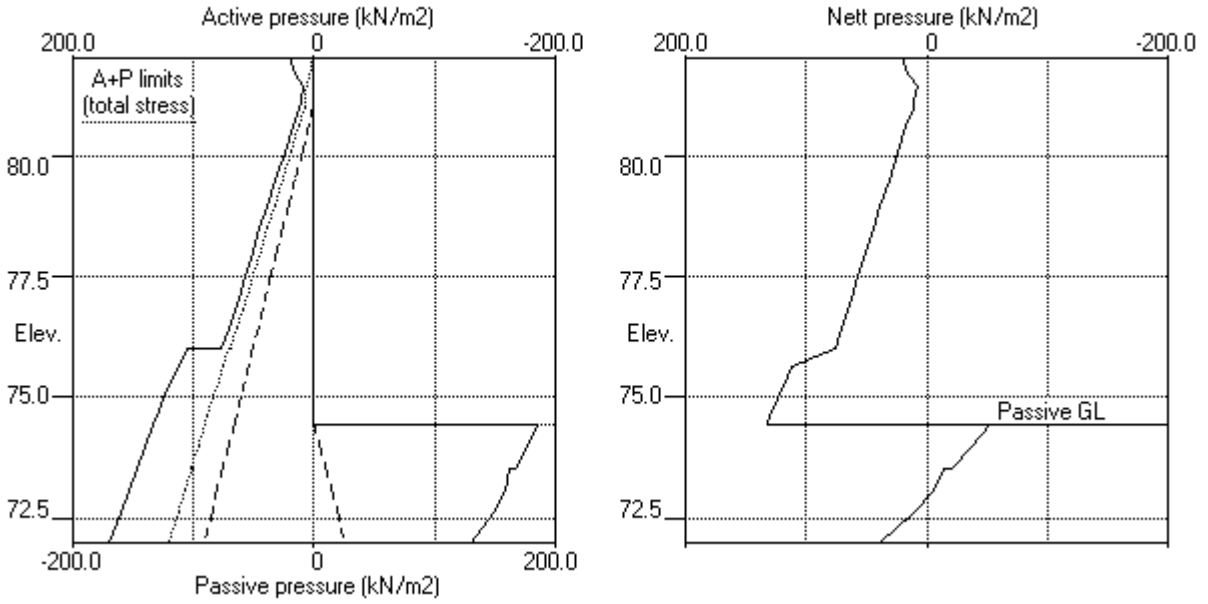
Stage No.20 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Units: kN,m

Stage No.20 Change soil type 3 to soil type 6



Stage No.20 Change soil type 3 to soil type 6



Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 1

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment Calculated		Bending moment Factored		Shear force Calculated		Shear force Factored	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
		m	m	kN.m/m		kN.m/m		kN/m	kN/m	kN/m	kN/m
1	82.00	0.005	0.000	0	0	0	0	0	0	0	0
2	81.75	0.005	0.000	1	-0	1	-0	5	-11	7	-15
3	81.43	0.005	0.000	3	-2	5	-3	10	-7	13	-10
4	81.10	0.005	0.000	7	-4	10	-5	12	-39	16	-53
5	81.00	0.005	0.000	8	-4	10	-6	6	-39	8	-53
6	80.60	0.006	0.000	10	-13	14	-17	12	-37	16	-49
7	80.05	0.006	0.000	17	-31	23	-42	23	-32	32	-43
8	79.50	0.007	0.000	33	-47	45	-63	39	-71	53	-96
9	78.95	0.007	0.000	60	-59	81	-80	59	-144	79	-195
10	78.47	0.008	0.000	0	-66	0	-89	12	-124	16	-168
11	78.00	0.009	0.000	0	-68	0	-91	22	-102	30	-137
12	77.50	0.010	0.000	0	-102	0	-137	17	-75	23	-101
13	77.15	0.010	0.000	0	-124	0	-168	24	-55	32	-74
14	76.80	0.010	0.000	0	-140	0	-188	32	-32	43	-44
15	76.40	0.010	0.000	2	-147	3	-199	43	-14	58	-19
16	76.00	0.010	0.000	7	-144	10	-194	57	0	77	0
17	75.65	0.009	0.000	11	-129	15	-174	68	0	91	0
18	75.30	0.009	0.000	16	-101	21	-136	108	0	146	0
19	74.95	0.008	0.000	22	-60	29	-81	150	-0	203	-0
20	74.60	0.007	0.000	24	-37	33	-50	195	-3	263	-4
21	74.45	0.007	0.000	24	-28	33	-38	95	-4	129	-5
22	73.97	0.006	0.000	26	-7	36	-9	42	-9	57	-12
23	73.50	0.005	0.000	23	0	31	0	11	-13	15	-17
24	73.05	0.005	0.000	21	0	28	0	0	-16	0	-22
25	72.60	0.004	0.000	11	0	15	0	0	-20	0	-27
26	72.00	0.003	0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment						Shear force					
	Calculated				Factored		Calculated				Factored	
no.	max. kN.m/m	elev.	min. kN.m/m	elev.	max. kN.m/m	min.	max. kN/m	elev.	min. kN/m	elev.	max. kN/m	min. kN/m
1	2	74.95	-2	78.00	3	-3	3	76.00	-1	73.50	4	-2
2	2	74.95	-2	78.00	3	-3	3	76.00	-1	73.50	4	-2
3	14	74.95	-3	77.50	18	-3	15	76.00	-6	73.50	20	-9
4	No calculation at this stage											
5	No calculation at this stage											
6	24	74.45	-68	78.00	33	-91	57	76.00	-39	81.10	77	-53
7	No calculation at this stage											
8	24	74.45	-67	78.00	32	-91	56	76.00	-39	81.10	76	-53
9	7	81.10	-76	76.00	9	-102	60	74.45	-69	78.00	81	-93
10	No calculation at this stage											
11	11	73.05	-86	76.00	15	-116	78	74.45	-70	78.00	105	-95
12	No calculation at this stage											
13	26	79.50	-100	76.40	35	-135	84	74.45	-71	79.50	113	-96
14	No calculation at this stage											
15	16	73.50	-97	76.40	22	-131	83	74.45	-68	78.95	112	-91
16	No calculation at this stage											
17	16	73.50	-96	76.40	22	-130	83	74.45	-69	78.95	111	-93
18	46	78.95	-127	76.40	62	-172	95	74.45	-131	78.95	129	-177
19	60	78.95	-147	76.40	81	-199	188	74.60	-144	78.95	254	-195
20	55	78.95	-139	76.40	74	-188	195	74.60	-139	78.95	263	-188

Maximum and minimum displacement at each stage

Stage	Displacement				Stage description
no.	maximum m	elev.	minimum m	elev.	
1	0.001	82.00	0.000	82.00	Apply surcharge no.3 at elev. 82.00
2	0.001	82.00	0.000	82.00	Apply water pressure profile no.1
3	0.005	82.00	0.000	82.00	Excav. to elev. 80.60 on PASSIVE side
4	No calculation at this stage				Install strut no.2 at elev. 81.10
5	No calculation at this stage				Apply water pressure profile no.3
6	0.007	78.47	0.000	82.00	Excav. to elev. 77.50 on PASSIVE side
7	No calculation at this stage				Install strut no.3 at elev. 78.00
8	0.007	78.47	0.000	82.00	Apply water pressure profile no.5
9	0.008	76.40	0.000	82.00	Excav. to elev. 74.45 on PASSIVE side
10	No calculation at this stage				Install strut no.4 at elev. 74.60
11	0.008	76.80	0.000	82.00	Apply surcharge no.4 at elev. 74.45
12	No calculation at this stage				Install strut no.5 at elev. 79.50
13	0.009	76.80	0.000	82.00	Remove strut no.3 at elev. 78.00
14	No calculation at this stage				Install strut no.6 at elev. 78.95
15	0.009	76.80	0.000	82.00	Remove strut no.5 at elev. 79.50
16	No calculation at this stage				Install strut no.7 at elev. 81.75
17	0.009	76.80	0.000	82.00	Remove strut no.2 at elev. 81.10
18	0.010	76.80	0.000	82.00	Change soil type 1 to soil type 4
19	0.010	76.80	0.000	82.00	Change soil type 2 to soil type 5
20	0.010	76.80	0.000	82.00	Change soil type 3 to soil type 6

Summary of results (continued)

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

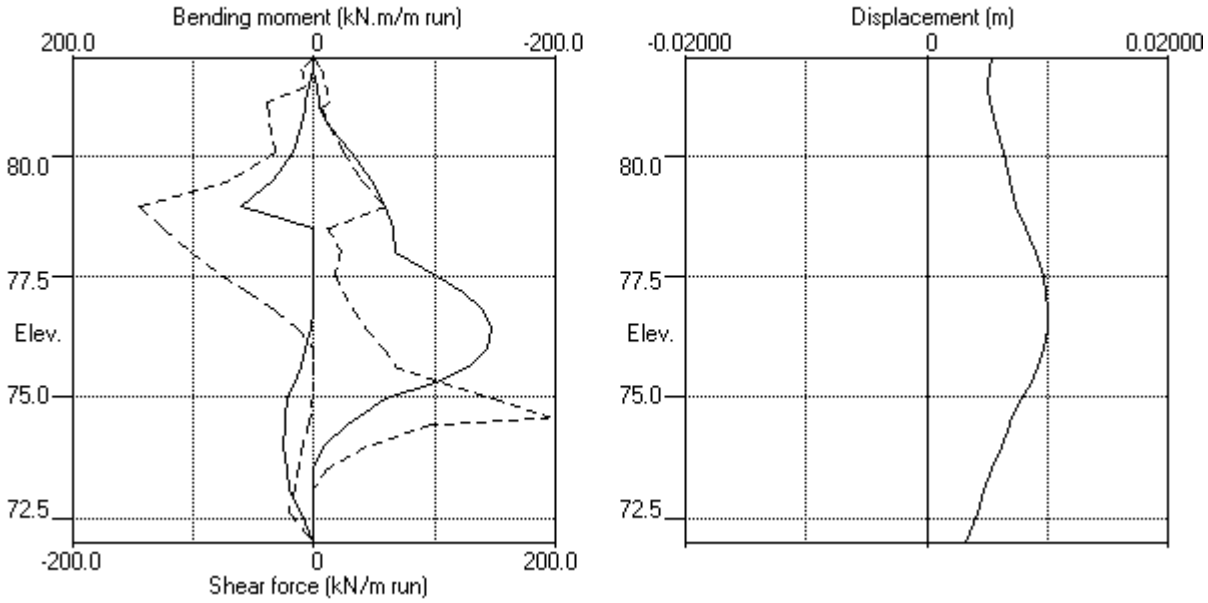
Stage no.	Strut no. 2 at elev. 81.10			Strut no. 3 at elev. 78.00			Strut no. 4 at elev. 74.60		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
6	50	151	204	---	---	---	---	---	---
8	50	151	204	0	1	1	---	---	---
9	31	94	127	91	273	369	---	---	---
11	34	101	137	89	268	362	slack	slack	slack
13	7	22	30	---	---	---	slack	slack	slack
15	23	70	95	---	---	---	slack	slack	slack
17	---	---	---	---	---	---	slack	slack	slack
18	---	---	---	---	---	---	slack	slack	slack
19	---	---	---	---	---	---	170	170	229
20	---	---	---	---	---	---	192	192	259

Stage no.	Strut no. 5 at elev. 79.50			Strut no. 6 at elev. 78.95			Strut no. 7 at elev. 81.75		
	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut	--Calculated-- kN per m run	kN per strut	Factored kN per strut
13	91	274	370	---	---	---	---	---	---
15	---	---	---	78	78	106	---	---	---
17	---	---	---	86	86	116	17	17	23
18	---	---	---	185	185	249	12	12	16
19	---	---	---	203	203	274	7	7	9
20	---	---	---	196	196	264	9	9	12

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Active side	Passive side
1	82.00	1 Made Ground / Alluv	1 Made Ground / Alluv
2	76.00	2 Claygate Beds	2 Claygate Beds
3	73.50	3 London Clay	3 London Clay

SOIL PROPERTIES (Unfactored SLS soil strengths)

No.	Soil type -- Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	Made Ground / Alluv	17.00	12500	0.500	NC (0.490)	1.000 (2.570)	1.000 (2.571)	25.00u
2	Claygate .. (76.00)	18.00	37500 (3000)	1.000	OC (0.490)	1.000 (2.000)	1.000 (2.000)	75.00u (6.000)
3	London Clay (73.50)	19.00	45000 (2608)	1.000	OC (0.490)	1.000 (1.000)	1.000 (1.000)	90.00u (5.200)
4	MG /Alluv Drained	17.00	7500	0.500	NC (0.250)	0.324 (1.327)	3.601 (5.104)	0.0d
5	Claygate .. (76.00)	18.00	22500 (1800)	1.000	OC (0.200)	0.351 (1.391)	3.440 (5.233)	0.0d
6	London Cl.. (73.50)	19.00	27000 (1565)	1.000	OC (0.200)	0.337 (1.360)	3.440 (5.233)	0.0d

Additional soil parameters associated with Ka and Kp

No.	Soil type ------- Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Made Ground / Alluv	0.00	1.000	0.00	0.00	1.000	0.00
2	Claygate Beds	0.00	0.000	0.00	0.00	0.000	0.00
3	London Clay	0.00	-0.674	0.00	0.00	-0.674	0.00
4	MG /Alluv Drained	27.00	0.641	0.00	27.00	0.471	0.00
5	Claygate Drained	25.00	0.670	0.00	25.00	0.670	0.00
6	London Clay Drained	26.00	0.670	0.00	25.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	81.00	81.00

Automatic water pressure balancing at toe of wall : No

Water press. profile no.	Active side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Passive side Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	81.00	81.00	0.0	1	80.60	80.60	0.0	MC
2	1	82.00	82.00	0.0	1	78.60	78.60	0.0	WC
3	1	81.00	81.00	0.0	1	77.50	77.50	0.0	MC
4	1	82.00	82.00	0.0	1	76.40	76.40	0.0	WC
5	1	81.00	81.00	0.0	1	74.45	74.45	0.0	MC
6	1	82.00	82.00	0.0	1	73.95	73.95	0.0	WC

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 72.00
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.8000E+07 kN/m2
Moment of inertia of wall I = 3.3550E-03 m4/m run
E.I = 93940 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	84.40	3.00	0.010000	2.000E+08	2.00	0.00	0	No
2	81.10	3.00	0.010000	2.000E+08	4.00	0.00	0	No
3	78.00	3.00	0.010000	2.000E+08	4.00	0.00	0	No
4	74.60	1.00	0.350000	3.000E+07	1.00	0.00	0	No
5	79.50	3.00	0.100000	2.000E+08	4.00	0.00	0	No
6	78.95	1.00	0.250000	2.000E+08	1.00	0.00	0	No
7	81.75	1.00	0.250000	3.000E+07	1.00	0.00	0	No
8	84.40	1.00	0.250000	3.000E+07	1.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	81.50	1.30(A)	0.50	20.00	100.00	=	N/A	1.00 P/U
2	81.50	0.80(A)	20.00	0.50	80.00	=	N/A	1.00 P/U
3	82.00	0.00(A)	20.00	20.00	5.00	=	N/A	1.30 Var
4	74.45	-0.00(P)	8.00	10.00	65.50	=	N/A	1.00 -

Note: A = Active side, P = Passive side
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.3 at elevation 82.00
2	Apply water pressure profile no.2 (Worst Cred.)
3	Excavate to elevation 80.60 on PASSIVE side
4	Install strut or anchor no.2 at elevation 81.10
5	Apply water pressure profile no.4 (Worst Cred.)
	No analysis at this stage
6	Excavate to elevation 77.50 on PASSIVE side
7	Install strut or anchor no.3 at elevation 78.00
8	Apply water pressure profile no.6 (Worst Cred.)
9	Excavate to elevation 74.45 on PASSIVE side
10	Install strut or anchor no.4 at elevation 74.60
11	Apply surcharge no.4 at elevation 74.45
12	Install strut or anchor no.5 at elevation 79.50
13	Remove strut or anchor no.3 at elevation 78.00
14	Install strut or anchor no.6 at elevation 78.95
15	Remove strut or anchor no.5 at elevation 79.50
16	Install strut or anchor no.7 at elevation 81.75
17	Remove strut or anchor no.2 at elevation 81.10
18	Change properties of soil type 1 to soil type 4
	Ko pressures will be reset
19	Change properties of soil type 2 to soil type 5
	Ko pressures will be reset
20	Change properties of soil type 3 to soil type 6
	Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 2
Water pressures : Worst Credible
Partial factor on C' = 1.250
Partial factor on Phi' = 1.250
Partial factor on Cu = 1.400
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.300

Stability analysis:
Method of analysis - Strength Factor method
Overall factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 20.00 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 6.00 m

Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 10.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.3 at elev. 82.00	No	No	No
2	Apply water pressure profile no.2	No	No	No
3	Excav. to elev. 80.60 on PASSIVE side	No	No	No
4	Install strut no.2 at elev. 81.10	No	No	No
5	Apply water pressure profile no.4	No	No	No
6	Excav. to elev. 77.50 on PASSIVE side	No	No	No
7	Install strut no.3 at elev. 78.00	No	No	No
8	Apply water pressure profile no.6	No	No	No
9	Excav. to elev. 74.45 on PASSIVE side	No	No	No
10	Install strut no.4 at elev. 74.60	No	No	No
11	Apply surcharge no.4 at elev. 74.45	No	No	No
12	Install strut no.5 at elev. 79.50	No	No	No
13	Remove strut no.3 at elev. 78.00	No	No	No
14	Install strut no.6 at elev. 78.95	No	No	No
15	Remove strut no.5 at elev. 79.50	No	No	No
16	Install strut no.7 at elev. 81.75	No	No	No
17	Remove strut no.2 at elev. 81.10	No	No	No
18	Change soil type 1 to soil type 4	No	No	No
19	Change soil type 2 to soil type 5	No	No	No
20	Change soil type 3 to soil type 6	Yes	No	Yes
*	Summary output	Yes	-	Yes

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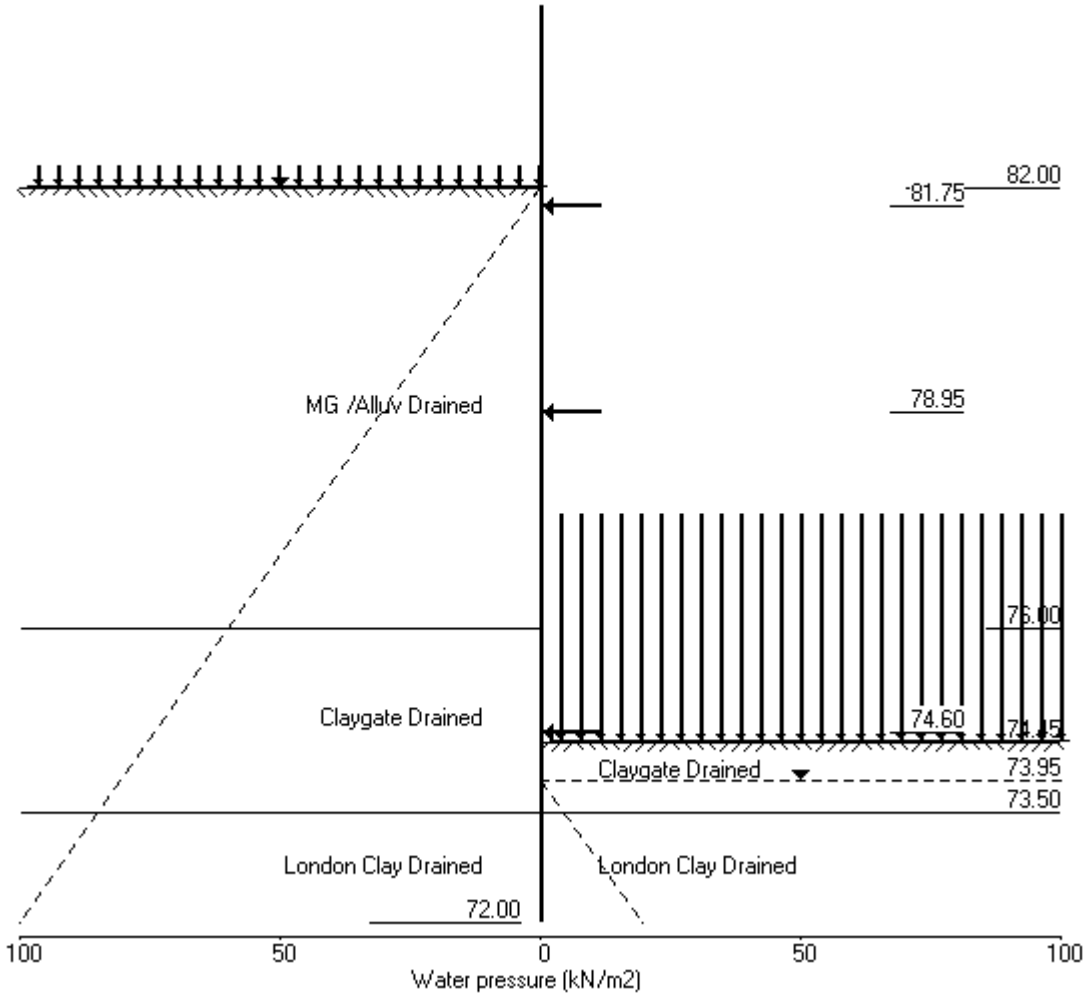
Units: kN,m

Stage No.20 Change soil type 3 to soil type 6



Units: kN,m

Stage No. 20 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
20	82.00	74.45		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall
Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	82.00	17.61	0.004	-1.11E-03	0.0	0.0	
2	81.75	18.53	0.004	-1.11E-03	4.5	0.7	12.4
		18.53	0.004	-1.11E-03	-7.8	0.7	
3	81.43	11.08	0.005	-1.11E-03	-3.0	-0.9	
4	81.10	15.53	0.005	-1.11E-03	1.3	-1.1	
5	81.00	16.90	0.005	-1.10E-03	2.9	-0.9	
6	80.60	22.38	0.006	-1.11E-03	10.8	1.8	
7	80.05	29.87	0.006	-1.15E-03	25.1	12.1	
8	79.50	37.25	0.007	-1.27E-03	43.6	30.7	
9	78.95	44.38	0.008	-1.54E-03	66.0	60.6	215.7
		44.38	0.008	-1.54E-03	-149.7	60.6	
10	78.60	48.85	0.008	-1.67E-03	-133.4	11.3	
11	78.00	56.37	0.009	-1.52E-03	-101.8	-60.6	
12	77.50	62.66	0.010	-1.08E-03	-72.0	-104.3	
13	76.95	69.69	0.010	-3.83E-04	-35.6	-134.2	
14	76.40	76.91	0.010	4.28E-04	4.7	-143.2	
15	76.00	82.31	0.010	1.02E-03	36.5	-135.1	
		106.68	0.010	1.02E-03	36.5	-135.1	
16	75.65	112.99	0.010	1.48E-03	75.0	-115.8	
17	75.30	119.37	0.009	1.85E-03	115.6	-82.8	
18	74.95	125.72	0.008	2.07E-03	158.5	-34.9	
19	74.60	131.81	0.008	2.08E-03	203.6	28.3	209.1
		131.81	0.008	2.08E-03	-5.5	28.3	
20	74.45	134.07	0.007	2.04E-03	14.4	29.1	
		-40.02	0.007	2.04E-03	14.4	29.1	
21	73.95	-48.19	0.006	1.87E-03	-7.6	33.1	
22	73.50	-34.86	0.006	1.74E-03	-26.3	24.4	
		10.75	0.006	1.74E-03	-26.3	24.4	
23	73.05	14.21	0.005	1.65E-03	-20.7	13.1	
24	72.60	17.86	0.004	1.60E-03	-13.5	4.6	

(continued)

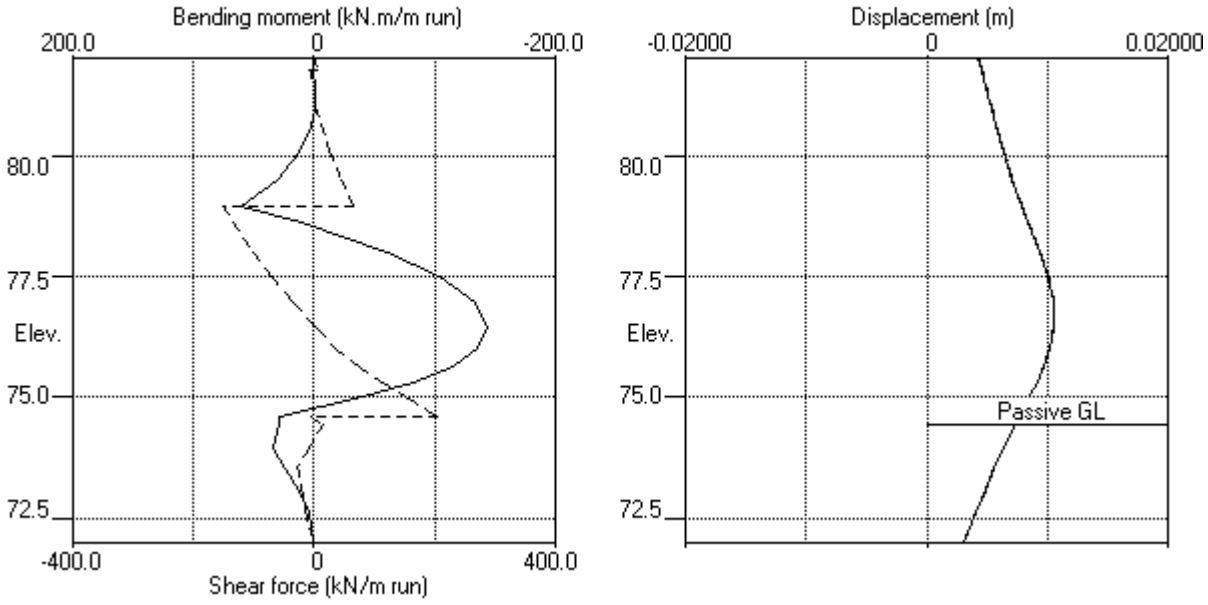
Stage No.20 Change properties of soil type 3 to soil type 6
Ko pressures will be reset

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
25	72.00	27.13	0.003	1.59E-03	0.0	0.0	

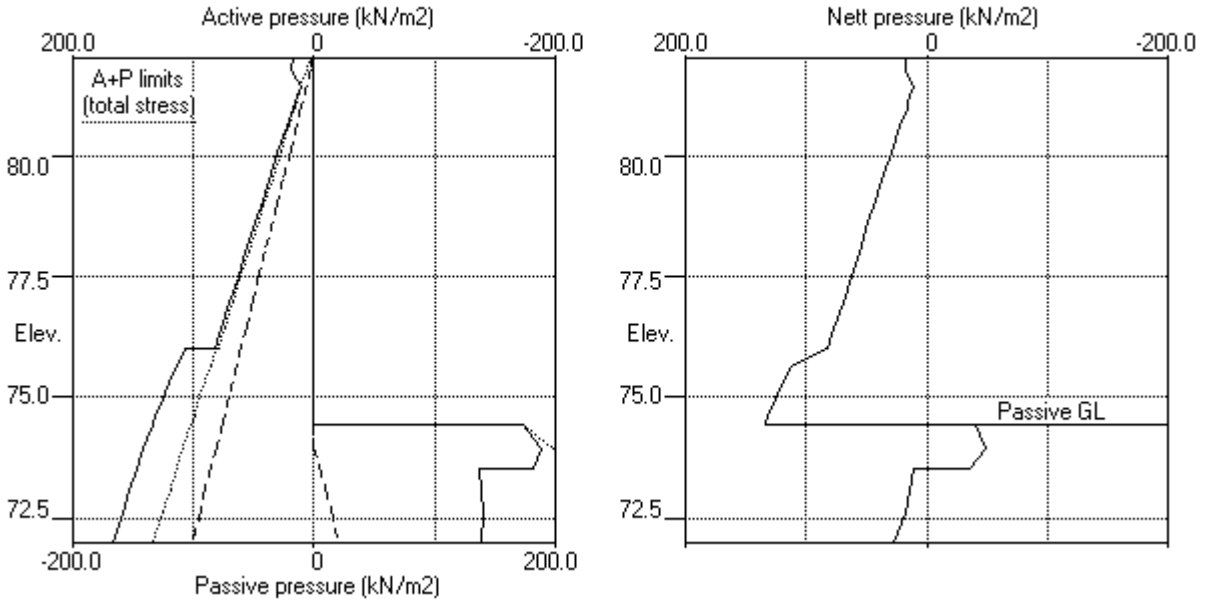
At elev. 81.75 Strut force = 12.4 kN/strut = 12.4 kN/m run
At elev. 78.95 Strut force = 215.7 kN/strut = 215.7 kN/m run
At elev. 74.60 Strut force = 209.1 kN/strut = 209.1 kN/m run

Units: kN,m

Stage No.20 Change soil type 3 to soil type 6



Stage No.20 Change soil type 3 to soil type 6



Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: ULS DA1 Combination 2
Water pressures : Worst Credible
Partial factor on C' = 1.250
Partial factor on Phi' = 1.250
Partial factor on Cu = 1.400
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Permanent Variable loads = 1.300

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	Overall FoS for toe elev. = 72.00 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation
1	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
2	82.00	82.00	Cant.	Conditions not suitable for FoS calc.			
3	82.00	80.60	Cant.	3.439	73.22	80.12	0.48
4	82.00	80.60		No analysis at this stage			
5	82.00	80.60		No analysis at this stage			
6	82.00	77.50	81.10	1.965	n/a	75.87	1.63
7	82.00	77.50		No analysis at this stage			

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 6.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 20.00 from wall

Limit State: ULS DA1 Combination 2

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement maximum m	Displacement minimum m	Bending moment maximum kN.m/m	Bending moment minimum kN.m/m	Shear force maximum kN/m	Shear force minimum kN/m
1	82.00	0.006	0.000	0.0	-0.0	0.0	0.0
2	81.75	0.006	0.000	0.8	-0.0	5.7	-10.2
3	81.43	0.005	0.000	3.7	-1.6	10.4	-5.4
4	81.10	0.005	0.000	7.7	-2.6	13.2	-40.3
5	81.00	0.006	0.000	9.0	-2.6	13.9	-39.8
6	80.60	0.006	0.000	15.2	-12.7	17.2	-37.4
7	80.05	0.007	0.000	26.9	-31.4	27.3	-32.8
8	79.50	0.007	0.000	41.3	-48.0	45.8	-85.2
9	78.95	0.008	0.000	66.5	-60.8	68.2	-155.3
10	78.60	0.008	0.000	15.2	-66.2	11.1	-139.0
11	78.00	0.009	0.000	1.6	-71.2	25.1	-107.5
12	77.50	0.010	0.000	0.0	-106.6	17.4	-77.9
13	76.95	0.011	0.000	0.0	-139.9	29.7	-42.2
14	76.40	0.011	0.000	2.9	-152.1	46.5	-13.7
15	76.00	0.010	0.000	7.7	-146.6	60.9	0.0
16	75.65	0.010	0.000	11.6	-129.7	75.0	0.0
17	75.30	0.009	0.000	17.1	-99.1	115.6	0.0
18	74.95	0.008	0.000	23.6	-59.2	158.5	-0.5
19	74.60	0.008	0.000	28.3	-36.2	203.6	-5.5
20	74.45	0.007	0.000	29.1	-26.2	98.1	-4.2
21	73.95	0.007	0.000	33.1	-2.2	34.5	-10.1
22	73.50	0.006	0.000	24.4	0.0	0.0	-26.3
23	73.05	0.005	0.000	15.7	0.0	0.0	-20.7
24	72.60	0.005	0.000	7.0	-0.8	0.0	-16.8
25	72.00	0.004	0.000	0.0	-0.0	0.0	-0.0

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage	Bending moment				Shear force			
no.	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	2.8	74.95	-2.4	78.00	3.8	76.00	-1.4	73.50
2	2.5	74.95	-2.2	78.00	3.4	76.00	-1.2	73.50
3	14.0	74.95	-1.9	77.50	14.6	76.00	-6.6	73.50
4	No calculation at this stage							
5	No calculation at this stage							
6	26.1	74.45	-71.2	78.00	60.9	76.00	-40.3	81.10
7	No calculation at this stage							
8	26.0	74.45	-70.9	78.00	60.8	76.00	-40.2	81.10
9	6.9	81.10	-80.6	76.00	62.8	74.45	-80.5	78.00
10	No calculation at this stage							
11	9.2	73.50	-90.6	76.00	80.5	74.45	-81.8	78.00
12	No calculation at this stage							
13	41.3	79.50	-114.0	76.40	90.2	74.45	-85.2	79.50
14	No calculation at this stage							
15	17.9	73.50	-109.8	76.40	88.6	74.45	-83.6	78.95
16	No calculation at this stage							
17	17.7	73.50	-109.3	76.40	88.4	74.45	-84.4	78.95
18	53.8	78.95	-133.1	76.40	98.1	74.45	-143.3	78.95
19	66.5	78.95	-152.1	76.40	196.0	74.60	-155.3	78.95
20	60.6	78.95	-143.2	76.40	203.6	74.60	-149.7	78.95

Maximum and minimum displacement at each stage

Stage	Displacement				Stage description
no.	maximum m	elev.	minimum m	elev.	
1	0.001	82.00	0.000	82.00	Apply surcharge no.3 at elev. 82.00
2	0.001	82.00	0.000	82.00	Apply water pressure profile no.2
3	0.006	82.00	0.000	82.00	Excav. to elev. 80.60 on PASSIVE side
4	No calculation at this stage				Install strut no.2 at elev. 81.10
5	No calculation at this stage				Apply water pressure profile no.4
6	0.007	78.60	0.000	82.00	Excav. to elev. 77.50 on PASSIVE side
7	No calculation at this stage				Install strut no.3 at elev. 78.00
8	0.007	78.60	0.000	82.00	Apply water pressure profile no.6
9	0.009	76.40	0.000	82.00	Excav. to elev. 74.45 on PASSIVE side
10	No calculation at this stage				Install strut no.4 at elev. 74.60
11	0.009	76.95	0.000	82.00	Apply surcharge no.4 at elev. 74.45
12	No calculation at this stage				Install strut no.5 at elev. 79.50
13	0.010	76.95	0.000	82.00	Remove strut no.3 at elev. 78.00
14	No calculation at this stage				Install strut no.6 at elev. 78.95
15	0.010	76.95	0.000	82.00	Remove strut no.5 at elev. 79.50
16	No calculation at this stage				Install strut no.7 at elev. 81.75
17	0.010	76.95	0.000	82.00	Remove strut no.2 at elev. 81.10
18	0.010	76.95	0.000	82.00	Change soil type 1 to soil type 4
19	0.011	76.40	0.000	82.00	Change soil type 2 to soil type 5
20	0.010	76.95	0.000	82.00	Change soil type 3 to soil type 6

Summary of results (continued)

Strut forces at each stage (horizontal components)

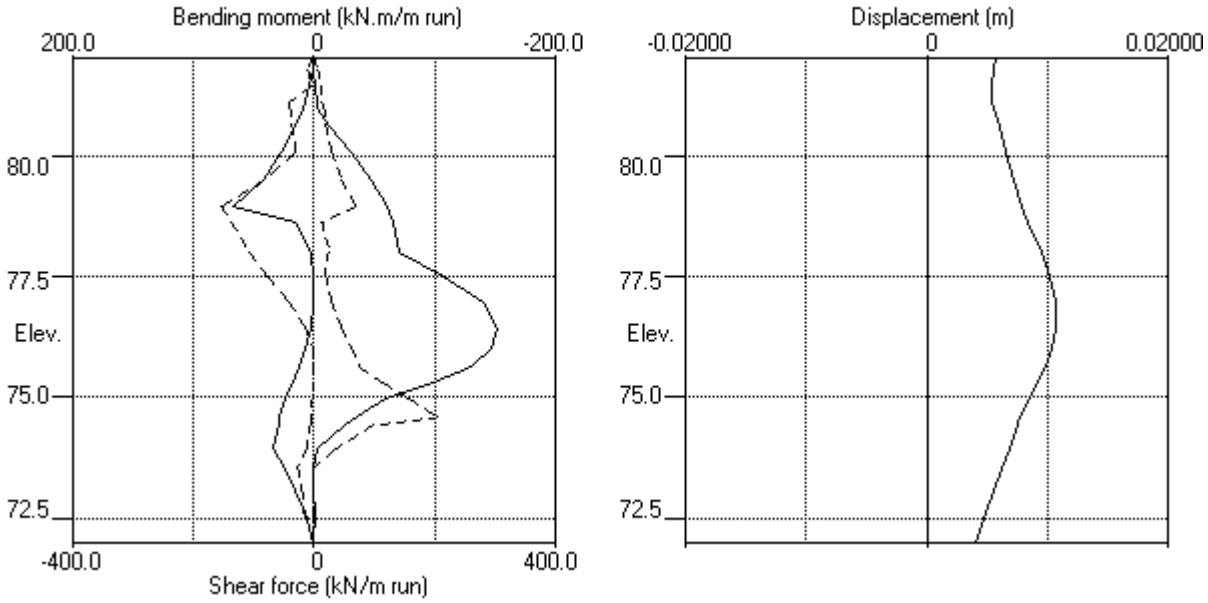
Stage no.	Strut no. 2 at elev. 81.10		Strut no. 3 at elev. 78.00		Strut no. 4 at elev. 74.60	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
6	51.54	154.62	---	---	---	---
8	51.47	154.42	0.13	0.40	---	---
9	30.00	90.00	105.55	316.65	---	---
11	32.50	97.50	103.96	311.87	slack	slack
13	slack	slack	---	---	slack	slack
15	19.13	57.40	---	---	slack	slack
17	---	---	---	---	slack	slack
18	---	---	---	---	slack	slack
19	---	---	---	---	186.84	186.84
20	---	---	---	---	209.10	209.10

Stage no.	Strut no. 5 at elev. 79.50		Strut no. 6 at elev. 78.95		Strut no. 7 at elev. 81.75	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
13	115.04	345.13	---	---	---	---
15	---	---	99.74	99.74	---	---
17	---	---	105.66	105.66	13.65	13.65
18	---	---	206.81	206.81	14.72	14.72
19	---	---	223.58	223.58	10.31	10.31
20	---	---	215.73	215.73	12.36	12.36

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

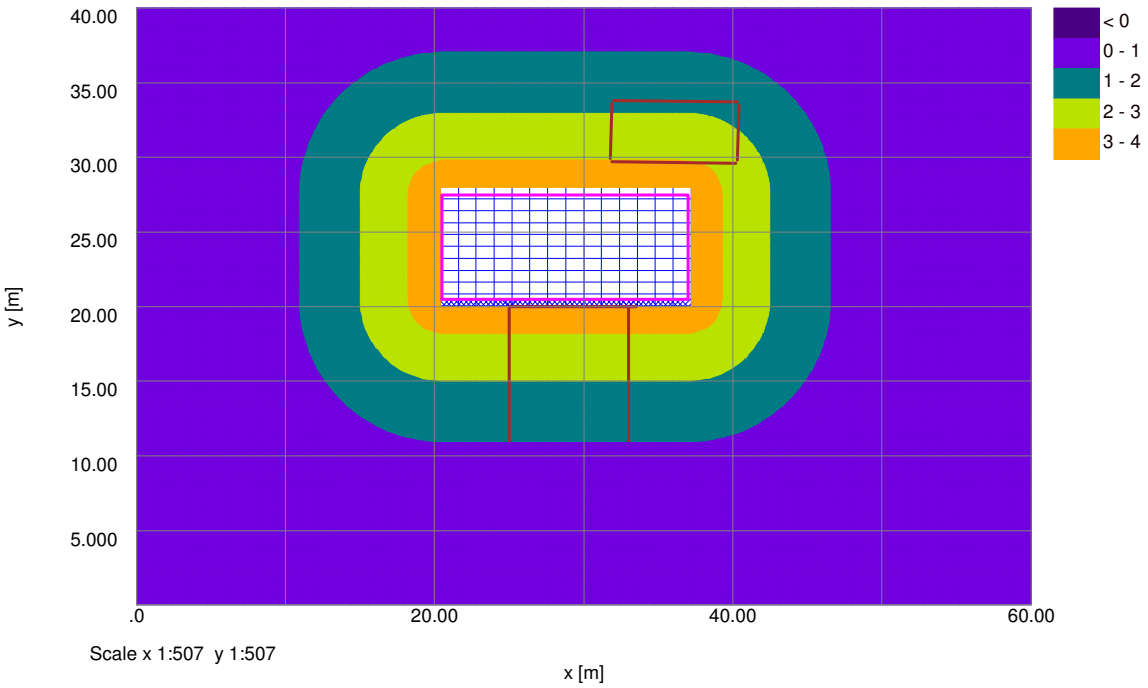
Bending moment, shear force, displacement envelopes



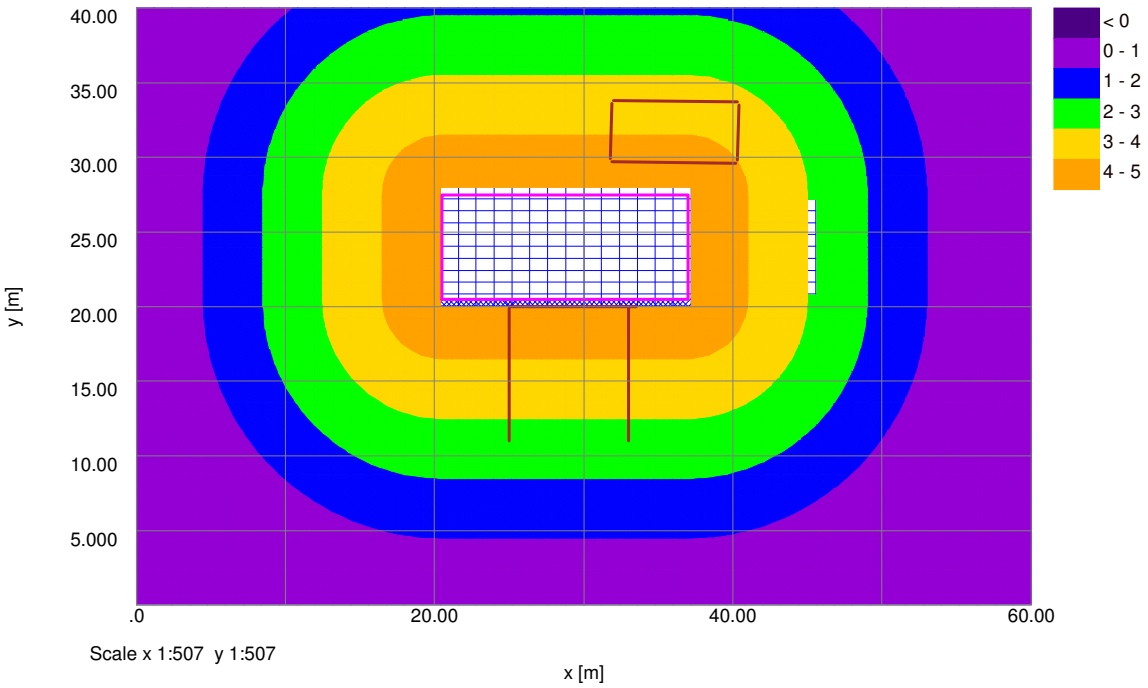
APPENDIX 5

Soil Displacement Model Results

Horizontal Displacement Contours: Grid 1 (level 82.000m) Interval 1mm

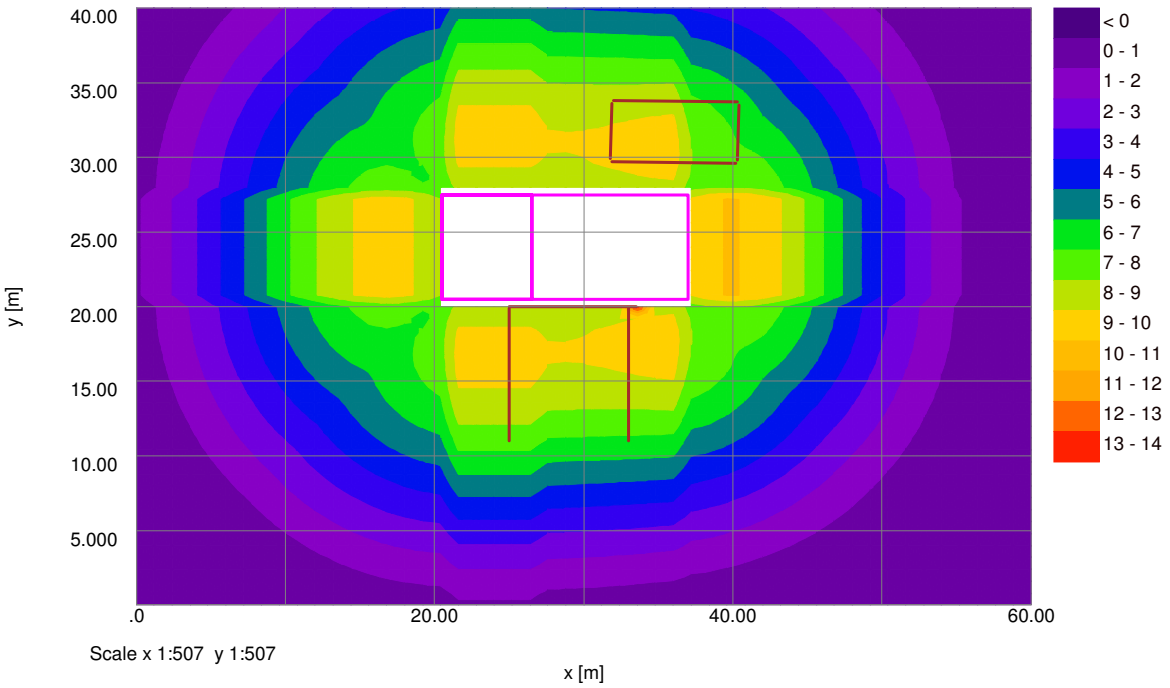


Vertical Settlement Contours: Grid 1 (level 82.000m) (Interval 1mm)



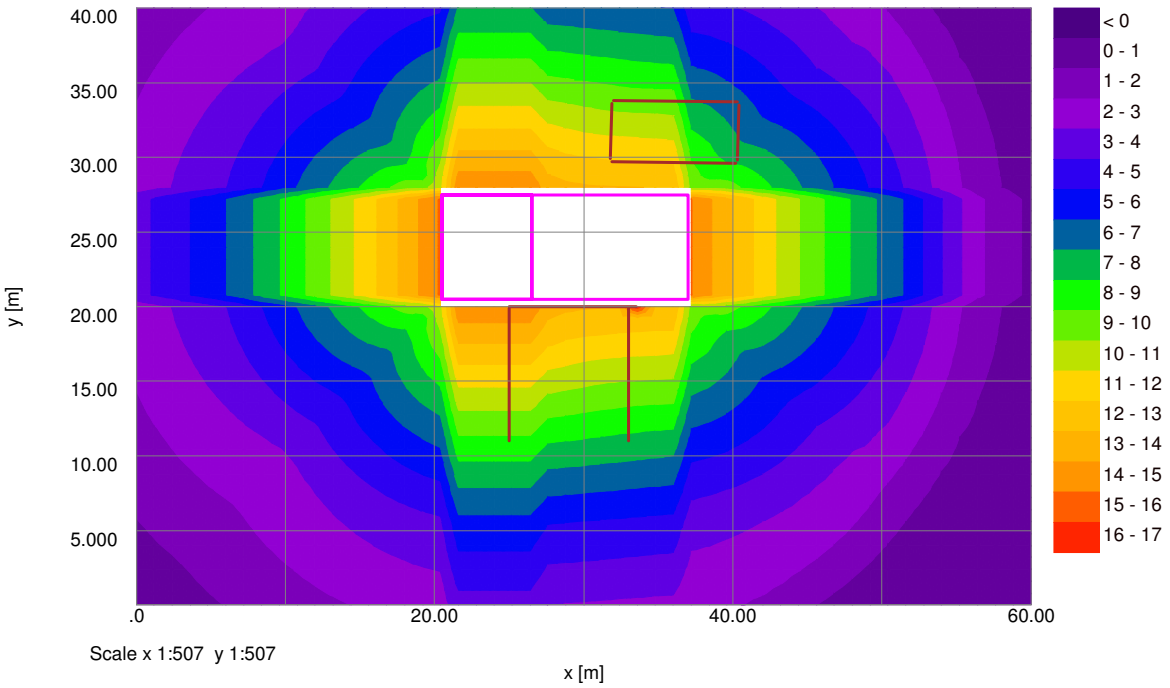
Scale x 1:507 y 1:507

Vertical Settlement Contours: Grid 1 (level 82.000m) (Interval 1mm)



Scale x 1:507 y 1:507

Horizontal Displacement Contours: Grid 1 (level 82.000m) Interval 1mm



Scale x 1:507 y 1:507

Problem Type

Problem Type : Tunnelling and Embedded Wall Excavations

Displacement Data

Type	Name	Direction of extrusion	Point/Line/Line for extrusion						No. of intervals across extrusion/line	Extrusion depth	No. of intervals along extrusion	Calculate	Surface type for tunnels
			First point			Second point							
			X [m]	Y [m]	Z(level) [m]	X [m]	Y [m]	Z(level) [m]		[m]			
Line	Line 1	-	20.50000	20.00000	82.00000	37.00000	20.00000	82.00000	50	-	-	Yes	Sub-surface
Grid	Grid 1	Global X	0.00000	0.00000	82.00000	-	40.00000	82.00000	50	60.00000	50	Yes	Sub-surface
Grid	Grid 2	Global Y	20.00000	20.00000	82.00000	37.00000	-	82.00000	10	3.00000	10	Yes	Sub-surface
Line	Line 2	-	25.00000	20.00000	82.00000	25.00000	10.00000	82.00000	10	-	-	Yes	Sub-surface
Line	Line 3	-	33.00000	20.00000	82.00000	33.00000	10.00000	82.00000	10	-	-	Yes	Sub-surface
Line	Nthfld Swim Pool Sth	-	31.80000	29.70000	83.65000	40.30000	29.60000	83.65000	10	-	-	Yes	Surface
Line	Nthfld Swim Pool West	-	31.80000	29.80000	83.65000	31.90000	33.80000	83.65000	5	-	-	Yes	Surface
Line	Nthfld Swim Pool East	-	40.30000	29.70000	83.65000	40.40000	33.60000	83.65000	5	-	-	Yes	Surface
Line	Nthfld Swim Pool Nth	-	31.90000	33.80000	83.65000	40.40000	33.70000	83.65000	10	-	-	Yes	Surface

Vertical Ground Movement Curves

Curve Name: **Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)**

Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Settlement / wall depth or max. excavation depth (z)(%)]
[0.000,0.000,0.039][0.100,0.000,0.049][0.200,0.000,0.056][0.300,0.000,0.062]
[0.400,0.000,0.067][0.500,0.000,0.070][0.600,0.000,0.072][0.700,0.000,0.073]
[0.800,0.000,0.073][0.900,0.000,0.072][1.000,0.000,0.070][1.100,0.000,0.068]
[1.200,0.000,0.065][1.300,0.000,0.061][1.400,0.000,0.058][1.500,0.000,0.054]
[1.600,0.000,0.050][1.700,0.000,0.046][1.800,0.000,0.042][1.900,0.000,0.038]
[2.000,0.000,0.034][2.100,0.000,0.030][2.200,0.000,0.027][2.300,0.000,0.023]
[2.400,0.000,0.020][2.500,0.000,0.017][2.600,0.000,0.014][2.700,0.000,0.012]
[2.800,0.000,0.010][2.900,0.000,0.008][3.000,0.000,0.007][3.100,0.000,0.005]
[3.200,0.000,0.004][3.300,0.000,0.004][3.400,0.000,0.003][3.500,0.000,0.002]
[3.600,0.000,0.002][3.700,0.000,0.002][3.800,0.000,0.001][3.900,0.000,0.001]
[4.000,0.000,0.000]

Curve Fitting Method: Polynomial
x Order: 4
y Order: 0
Polynomial: z = $-2.6455E-3x^4 + 2.8495E-2x^3 - 1.0051E-1x^2 + 1.0569E-1x + 3.8990E-2$
Coeff. of Determination: 9.9991E-1

Horizontal Ground Movement Curves

Curve Name: **Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))**

Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Horizontal movement / wall depth or max. excavation depth (z)(%)]
[0.000,0.000,0.150][4.000,0.000,0.000]

Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = $-3.75E-2x + 1.50E-1$
Coeff. of Determination: 1.00

Polygonal Excavations

Excavation Name: **General Excavation**
Surface level [m]: 82.000
Contribution: Positive
Enabled: Yes
Surface movement curves which are selected are applied between surface and [m]: 75.750

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	20.500	20.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	20.500	27.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	37.000	27.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	37.000	20.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve: Vertical	Ground Movement Curve: Horizontal
1	20.500	20.500	20.500	27.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
2	20.500	27.500	37.000	27.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
3	37.000	27.500	37.000	20.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
4	37.000	20.500	20.500	20.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))

Excavation Name: **Pool of General Excavation**
Surface level [m]: 82.000
Contribution: Positive
Enabled: Yes
Surface movement curves which are selected are applied between surface and [m]: 74.450

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	20.500	20.500	74.450	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	20.500	27.500	74.450	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	26.500	27.500	74.450	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	26.500	20.500	74.450	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve: Vertical	Ground Movement Curve: Horizontal
1	20.500	20.500	20.500	27.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
2	20.500	27.500	26.500	27.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
3	26.500	27.500	26.500	20.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
4	26.500	20.500	20.500	20.500	Excavation in front of high	Excavation in front of high

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
					stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))

Excavation Name: Upper Pool Excavation
Surface level [m]: 82.000
Contribution: Negative
Enabled: Yes
Surface movement curves which are selected are applied between surface and [m]: 75.750

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side pl [%]	Previous Side p2* [%]	Next Side d [m]	Next Side pl [%]	Next Side p2* [%]
1	20.500	20.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	20.500	27.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	26.500	27.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	26.500	20.500	75.750	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
1	20.500	20.500	20.500	27.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
2	20.500	27.500	26.500	27.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
3	26.500	27.500	26.500	20.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
4	26.500	20.500	20.500	20.500	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))

Damage Category Strains

Name	0 (Negligible) to 1 (Very Slight)	1 (Very Slight) to 2 (Slight)	2 (Slight) to 3 (Moderate)	3 (Moderate) to 4 (Severe)
Burland Strain Limits	0.0	500.00E-6	750.00E-6	0.0015000

Specific Structures - Geometry

Structure Name	Sub-Structure Name	Displacement Line	Start Distance Along Line [m]	End Distance Along Line [m]	Vertical Offsets from Line for Vertical Movement Calculations [m]	Vertical Displacement Limit Sensitivity [mm]	Damage Category Strains	Poisson's Ratio	E/G
57 Maresfield	North Elevation	Line 1	4.50000	13.00000	0	0.10000	Burland Strain Limits	0.20000	2.6000
57 Maresfield	West Wall	Line 2	0.10000	9.00000	0	0.10000	Burland Strain Limits	0.20000	2.6000
57 Maresfield	East Wall	Line 3	0.10000	9.00000	0	0.10000	Burland Strain Limits	0.20000	2.6000
Netherfield Swimming Pool	South Wall	Nthfld Swim Pool Sth	0.10000	8.40000	0	0.10000	Burland Strain Limits	0.20000	2.6000
Netherfield Swimming Pool	West Wall	Nthfld Swim Pool West	0.10000	3.80000	0	0.10000	Burland Strain Limits	0.20000	2.6000
Netherfield Swimming Pool	East Wall	Nthfld Swim Pool East	0.10000	3.80000	0	0.10000	Burland Strain Limits	0.20000	2.6000
Netherfield Swimming Pool	North Wall	Nthfld Swim Pool Nth	0.10000	8.40000	0	0.10000	Burland Strain Limits	0.20000	2.6000

Specific Structures - Bending Parameters

Structure Name	Sub-Structure Name	Height [m]	Default Properties	Hogging 2nd Moment of Area (per unit width) [m³]	Hogging Distance of Bending Strain from N.A. [m]	Hogging Distance of N.A. from Edge of Beam in Tension [m]	Sagging 2nd Moment of Area (per unit width) [m³]	Sagging Distance of Bending Strain from N.A. [m]	Sagging Distance of N.A. from Edge of Beam in Tension [m]
57 Maresfield	North Elevation	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
57 Maresfield	West Wall	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
57 Maresfield	East Wall	10.000	Yes	333.33	10.000	10.000	83.333	5.0000	5.0000
Netherfield Swimming Pool	South Wall	2.0000	Yes	2.6667	2.0000	2.0000	0.66667	1.0000	1.0000
Netherfield Swimming Pool	West Wall	2.0000	Yes	2.6667	2.0000	2.0000	0.66667	1.0000	1.0000
Netherfield Swimming Pool	East Wall	2.0000	Yes	2.6667	2.0000	2.0000	0.66667	1.0000	1.0000
Netherfield Swimming Pool	North Wall	2.0000	Yes	2.6667	2.0000	2.0000	0.66667	1.0000	1.0000

Building Segment Combinations

Structure Name	Sub-Structure Name	Vertical Offset from Line for Vertical Movement Calculations [m]	Segment Start [m]	Length [m]	Curvature	Combined Segment

No structures have segments combined.

Warnings

1 Multiple excavations have been specified. The displacements resulting from these excavations are calculated by summing the displacements resulting from each individual excavation. No account has been taken of the interactions between excavations (e.g. overlapping zones of influence or 'shielding' of one excavation by another).
2 Embedded Wall Excavation PE1 : General Excavation intersects PE2 : Pool of General Excavation, and PE3 : Upper Pool Excavation.
3 Embedded Wall Excavation PE2 : Pool of General Excavation intersects PE1 : General Excavation.
4 Embedded Wall Excavation PE3 : Upper Pool Excavation intersects PE1 : General Excavation.
5 If an embedded wall excavation is assigned a 'surface' ground movement curve and if the 'allow movement calculation to level' option is checked for the excavation then displacements induced by it are calculated for points at the surface, and points below the surface to the level specified. Others are ignored. An example of such a combination, for which displacements will not be calculated is Excavation XP1/Side 1/Line 4/Vertical. This is an example only. There are 95 others.

Displacement and Strain Results

Type/No. Name	Dist. [m]	Coordinates x [m]	y [m]	z [m]	Displacements x [mm]	y [mm]	z [mm]	Along the Line [mm]	Perpendicular to Line [mm]	Angle of Line to x Axis [°]
Line 1	Line 1	20.50000	20.00000	82.00000	0.0	11.127	7.1795	0.0	11.127	0.0 *
	0.33000	20.83000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	0.66000	21.16000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	0.99000	21.49000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	1.3200	21.82000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	1.6500	22.15000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
	1.9800	22.48000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	2.3100	22.81000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	2.6400	23.14000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	2.9700	23.47000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	3.3000	23.80000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	3.6300	24.13000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	3.9600	24.46000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	4.2900	24.79000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	4.6200	25.12000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	4.9500	25.45000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	5.2800	25.78000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	5.6100	26.11000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	5.9400	26.44000	20.00000	82.00000	0.0	14.802	8.3146	0.0	14.802	0.0 *
	6.2700	26.77000	20.00000	82.00000	-0.52148	13.818	8.0911	-0.52148	13.818	0.0 *
	6.6000	27.10000	20.00000	82.00000	-0.77841	13.501	8.0726	-0.77841	13.501	0.0 *
	6.9300	27.43000	20.00000	82.00000	-0.96735	13.372	8.1024	-0.96735	13.372	0.0 *
	7.2600	27.76000	20.00000	82.00000	-1.0662	13.275	8.1259	-1.0662	13.275	0.0 *
	7.5900	28.09000	20.00000	82.00000	-1.1237	13.206	8.1475	-1.1237	13.206	0.0 *
	7.9200	28.42000	20.00000	82.00000	-1.1603	13.154	8.1691	-1.1603	13.154	0.0 *
	8.2500	28.75000	20.00000	82.00000	-1.1853	13.116	8.1916	-1.1853	13.116	0.0 *
	8.5800	29.08000	20.00000	82.00000	-1.2033	13.085	8.2151	-1.2033	13.085	0.0 *
	8.9100	29.41000	20.00000	82.00000	-1.2168	13.061	8.2397	-1.2168	13.061	0.0 *
	9.2400	29.74000	20.00000	82.00000	-1.2273	13.042	8.2653	-1.2273	13.042	0.0 *
	9.5700	30.07000	20.00000	82.00000	-1.2357	13.025	8.2919	-1.2357	13.025	0.0 *
	9.9000	30.40000	20.00000	82.00000	-1.2425	13.012	8.3192	-1.2425	13.012	0.0 *
	10.230	30.73000	20.00000	82.00000	-1.2481	13.000	8.3471	-1.2481	13.000	0.0 *
	10.560	31.06000	20.00000	82.00000	-1.2529	12.990	8.3755	-1.2529	12.990	0.0 *
	10.890	31.39000	20.00000	82.00000	-1.2569	12.981	8.4040	-1.2569	12.981	0.0 *
	11.220	31.72000	20.00000	82.00000	-1.2604	12.973	8.4326	-1.2604	12.973	0.0 *
	11.550	32.05000	20.00000	82.00000	-1.2635	12.966	8.4611	-1.2635	12.966	0.0 *
	11.880	32.38000	20.00000	82.00000	-1.2661	12.960	8.4893	-1.2661	12.960	0.0 *
	12.210	32.71000	20.00000	82.00000	-1.2685	12.954	8.5170	-1.2685	12.954	0.0 *
	12.540	33.04000	20.00000	82.00000	-1.2706	12.949	8.5441	-1.2706	12.949	0.0 *
	12.870	33.37000	20.00000	82.00000	-1.2725	12.945	8.5704	-1.2725	12.945	0.0 *
	13.200	33.70000	20.00000	82.00000	-1.2742	12.941	8.5958	-1.2742	12.941	0.0 *
	13.530	34.03000	20.00000	82.00000	-1.2757	12.937	8.6201	-1.2757	12.937	0.0 *
	13.860	34.36000	20.00000	82.00000	-1.2771	12.933	8.6432	-1.2771	12.933	0.0 *
	14.190	34.69000	20.00000	82.00000	-1.2784	12.930	8.6650	-1.2784	12.930	0.0 *
	14.520	35.02000	20.00000	82.00000	-1.2796	12.927	8.6853	-1.2796	12.927	0.0 *
	14.850	35.35000	20.00000	82.00000	-1.2806	12.925	8.7042	-1.2806	12.925	0.0 *
	15.180	35.68000	20.00000	82.00000	-1.2816	12.922	8.7214	-1.2816	12.922	0.0 *
	15.510	36.01000	20.00000	82.00000	-1.2826	12.920	8.7369	-1.2826	12.920	0.0 *
	15.840	36.34000	20.00000	82.00000	-1.2834	12.917	8.7506	-1.2834	12.917	0.0 *
	16.170	36.67000	20.00000	82.00000	-1.2842	12.915	8.7624	-1.2842	12.915	0.0 *
	16.500	37.00000	20.00000	82.00000	-1.2850	13.546	12.682	-1.2850	13.546	0.0 *
Grid 1	Grid 1	0.00000	0.00000	82.00000	0.16024	0.16024	0.040622	-	-	- *
		1.20000	0.00000	82.00000	0.26618	0.28273	0.059369	-	-	- *
		2.40000	0.00000	82.00000	0.36357	0.41178	0.075758	-	-	- *
		3.60000	0.00000	82.00000	0.45118	0.54729	0.092754	-	-	- *
		4.80000	0.00000	82.00000	0.52768	0.68901	0.11256	-	-	- *
		6.00000	0.00000	82.00000	0.59165	0.83647	0.13667	-	-	- *
		7.20000	0.00000	82.00000	0.64161	0.98895	0.16588	-	-	- *
		8.40000	0.00000	82.00000	0.67607	1.1454	0.20039	-	-	- *
		9.60000	0.00000	82.00000	0.69357	1.3044	0.23984	-	-	- *
		10.80000	0.00000	82.00000	0.69282	1.4642	0.28337	-	-	- *
		12.00000	0.00000	82.00000	0.67275	1.6225	0.32973	-	-	- *
		13.20000	0.00000	82.00000	0.63267	1.7767	0.37735	-	-	- *
		14.40000	0.00000	82.00000	0.57242	1.9237	0.42442	-	-	- *
		15.60000	0.00000	82.00000	0.49245	2.0603	0.46903	-	-	- *
		16.80000	0.00000	82.00000	0.39398	2.1828	0.50923	-	-	- *
		18.00000	0.00000	82.00000	0.27902	2.2880	0.54320	-	-	- *
		19.20000	0.00000	82.00000	0.15044	2.3724	0.56929	-	-	- *
		20.40000	0.00000	82.00000	0.011869	2.4332	0.58619	-	-	- *
		21.60000	0.00000	82.00000	0.0	3.6375	0.87634	-	-	- *
		22.80000	0.00000	82.00000	0.0	3.6375	0.87634	-	-	- *
		24.00000	0.00000	82.00000	0.0	3.6375	0.87634	-	-	- *
		25.20000	0.00000	82.00000	0.0	3.6375	0.87634	-	-	- *
		26.40000	0.00000	82.00000	0.0	3.6375	0.87634	-	-	- *
		27.60000	0.00000	82.00000	-0.068792	2.9695	0.65300	-	-	- *
		28.80000	0.00000	82.00000	-0.14041	2.9390	0.63581	-	-	- *
		30.00000	0.00000	82.00000	-0.20787	2.9050	0.61300	-	-	- *
		31.20000	0.00000	82.00000	-0.27071	2.8682	0.58539	-	-	- *
		32.40000	0.00000	82.00000	-0.32864	2.8294	0.55397	-	-	- *
		33.60000	0.00000	82.00000	-0.38152	2.7891	0.51995	-	-	- *
		34.80000	0.00000	82.00000	-0.42937	2.7480	0.48481	-	-	- *
		36.00000	0.00000	82.00000	-0.47232	2.7067	0.45033	-	-	- *
		37.20000	0.00000	82.00000	-0.52158	2.1050	0.34200	-	-	- *
		38.40000	0.00000	82.00000	-0.61900	2.0294	0.31058	-	-	- *
		39.60000	0.00000	82.00000	-0.70576	1.9353	0.28462	-	-	- *
		40.80000	0.00000	82.00000	-0.77921	1.8254	0.26835	-	-	- *
		42.00000	0.00000	82.00000	-0.75344	1.5914	0.23456	-	-	- *
		43.20000	0.00000	82.00000	-0.70061	1.3504	0.20142	-	-	- *
		44.40000	0.00000	82.00000	-0.62172	1.1066	0.17134	-	-	- *
		45.60000	0.00000	82.00000	-0.51765	0.86304	0.14262	-	-	- *
		46.80000	0.00000	82.00000	-0.38973	0.62219	0.11232	-	-	- *
		48.00000	0.00000	82.00000	-0.24094	0.38750	0.076532	-	-	- *
		49.20000	0.00000	82.00000	-0.12154	0.20423	0.041004	-	-	- *
		50.40000	0.00000	82.00000	-0.056882	0.087022	0.022102	-	-	- *
		51.60000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		52.80000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		54.00000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		55.20000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		56.40000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		57.60000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	0.00000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	0.80000	82.00000	0.24117	0.23176	0.053551	-	-	- *
		1.20000	0.80000	82.00000	0.34549	0.35265	0.069784	-	-	- *
		2.40000	0.80000	82.00000	0.44534	0.48471	0.086807	-	-	- *
		3.60000	0.80000	82.00000	0.53528	0.62396	0.10647	-	-	- *
		4.80000	0.80000	82.00000	0.61387	0.77027	0.13076	-	-	- *
		6.00000	0.80000	82.00000	0.67954	0.92323	0.16093	-	-	- *
		7.20000	0.80000	82.00000	0.73062	1.0822	0.19757	-	-	- *
		8.40000	0.80000	82.00000	0.76542	1.2462	0.24060	-	-	- *
		9.60000	0.80000	82.00000	0.78223	1.4138	0.28941	-	-	- *
		10.80000	0.80000	82.00000	0.77949	1.5831	0.34287	-	-	- *
		12.00000	0.80000	82.00000	0.75586	1.7518	0.39945	-	-	- *
		13.20000	0.80000	82.00000	0.71040	1.9171	0.45727	-	-	- *
		14.40000	0.80000	82.00000	0.64270	2.0756	0.51424	-	-	- *
		15.60000	0.80000	82.00000	0.55309	2.2237	0.56813	-	-	- *
		16.80000	0.80000	82.00000	0.44275	2.3573	0.61671	-	-	- *
		18.00000	0.80000	82.00000	0.31379	2.4726	0.69335	-	-	- *
		19.20000	0.80000	82.00000	0.16932	2.5658	0.75393	-	-	- *
		20.40000	0.80000	82.00000	0.013369	2.6337	0.78546	-	-	- *
		21.60000	0.80000	82.00000	0.0	3.9375	1.1373	-	-	- *
		22.80000	0.80000	82.00000	0.0	3.9375	1.1373	-	-	- *
		24.00000	0.80000	82.00000	0.0	3.9375	1.1373	-	-	- *
		25.20000	0.80000	82.00000	0.0	3.9375	1.1373	-	-	- *
		26.40000	0.80000	82.00000	0.0	3.9375	1.1373	-	-	- *
		27.60000	0.80000	82.00000	-0.071526	3.2685	0.87344	-	-	- *
		28.80000	0.80000	82.00000	-0.14582	3.2365	0.85369	-	-	- *
		30.00000	0.80000	82.00000	-0.21556	3.2008	0.82784	-	-	- *
		31.20000	0.80000	82.00000	-0.28025	3.1622	0.79665	-	-	- *
		32.40000	0.80000	82.00000	-0.33960	3.1214	0.76101	-	-	- *
		33.60000	0.80000	82.00000	-0.39348	3.0793	0.72199	-	-	- *
		34.80000	0.80000	82.00000	-0.44192	3.0364	0.68091	-	-	- *
		36.00000	0.80000	82.00000	-0.48512	2.9935	0.63938	-	-	- *
		37.20000	0.80000	82.00000	-0.53681	2.2905	0.49951	-	-	- *
		38.40000	0.80000	82.00000	-0.64830	2.2077	0.44418	-	-	- *
		39.60000	0.80000	82.00000	-0.74776	2.1051	0.37333	-	-	- *
		40.80000	0.80000	82.00000	-0.83227	1.9858	0.30738	-	-	- *
		42.00000	0.80000	82.00000	-0.89153	1.8425	0.28575	-	-	- *
		43.20000	0.80000	82.00000	-0.84481	1.5871	0.24291	-	-	- *
		44.40000	0.80000	82.00000	-0.77000	1.3299	0.20514	-	-	- *
		45.60000	0.80000	82.00000	-0.66821	1.0738	0.17141	-	-	- *
		46.80000	0.80000	82.00000	-0.54439	0.82501	0.14020	-	-	- *
		48.00000	0.80000	82.00000	-0.39580	0.58080	0.10703	-	-	- *
		49.20000	0.80000	82.00000	-0.21950	0.33877	0.065217	-	-	- *
		50.40000	0.80000	82.00000	-0.13395	0.19693	0.040779	-	-	- *
		51.60000	0.80000	82.00000	-0.056965	0.076863	0.020629	-	-	- *
		52.80000	0.80000	82.00000	0.0	0.0	0.0	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		54.00000	0.80000	82.00000	0.0	0.0	0.0	-	-	- *
		55.20000	0.80000	82.00000	0.0	0.0	0.0	-	-	- *
		56.40000	0.80000	82.00000	0.0	0.0	0.0	-	-	- *
		57.60000	0.80000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	0.80000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	0.80000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	1.60000	82.00000	0.32502	0.29965	0.064932	-	-	- *
		1.20000	1.60000	82.00000	0.42888	0.41999	0.080465	-	-	- *
		2.40000	1.60000	82.00000	0.52765	0.55097	0.098822	-	-	- *
		3.60000	1.60000	82.00000	0.62030	0.69371	0.12250	-	-	- *
		4.80000	1.60000	82.00000	0.70142	0.84438	0.15256	-	-	- *
		6.00000	1.60000	82.00000	0.76927	1.0027	0.19003	-	-	- *
		7.20000	1.60000	82.00000	0.82200	1.1681	0.23526	-	-	- *
		8.40000	1.60000	82.00000	0.85768	1.3397	0.28795	-	-	- *
		9.60000	1.60000	82.00000	0.87433	1.5160	0.34722	-	-	- *
		10.80000	1.60000	82.00000	0.87007	1.6953	0.41167	-	-	- *
		12.00000	1.60000	82.00000	0.84326	1.8750	0.47949	-	-	- *
		13.20000	1.60000	82.00000	0.79261	2.0521	0.54852	-	-	- *
		14.40000	1.60000	82.00000	0.71747	2.2230	0.65135	-	-	- *
		15.60000	1.60000	82.00000	0.61795	2.3835	0.79925	-	-	- *
		16.80000	1.60000	82.00000	0.49515	2.5293	0.92362	-	-	- *
		18.00000	1.60000	82.00000	0.35129	2.6558	1.0213	-	-	- *
		19.20000	1.60000	82.00000	0.18975	2.7586	1.0895	-	-	- *
		20.40000	1.60000	82.00000	0.014996	2.8342	1.1262	-	-	- *
		21.60000	1.60000	82.00000	0.0	4.2375	1.5477	-	-	- *
		22.80000	1.60000	82.00000	0.0	4.2375	1.5477	-	-	- *
		24.00000	1.60000	82.00000	0.0	4.2375	1.5477	-	-	- *
		25.20000	1.60000	82.00000	0.0	4.2375	1.5477	-	-	- *
		26.40000	1.60000	82.00000	0.0	4.2375	1.5477	-	-	- *
		27.60000	1.60000	82.00000	-0.074486	3.5673	1.2428	-	-	- *
		28.80000	1.60000	82.00000	-0.15165	3.5337	1.2206	-	-	- *
		30.00000	1.60000	82.00000	-0.22383	3.4962	1.1921	-	-	- *
		31.20000	1.60000	82.00000	-0.29047	3.4556	1.1579	-	-	- *
		32.40000	1.60000	82.00000	-0.35126	3.4127	1.1187	-	-	- *
		33.60000	1.60000	82.00000	-0.40611	3.3686	1.0756	-	-	- *
		34.80000	1.60000	82.00000	-0.45510	3.3238	1.0296	-	-	- *
		36.00000	1.60000	82.00000	-0.49847	3.2792	0.98222	-	-	- *
		37.20000	1.60000	82.00000	-0.55270	2.4748	0.80470	-	-	- *
		38.40000	1.60000	82.00000	-0.67933	2.3842	0.73789	-	-	- *
		39.60000	1.60000	82.00000	-0.79235	2.2725	0.65171	-	-	- *
		40.80000	1.60000	82.00000	-0.88855	2.1429	0.55097	-	-	- *
		42.00000	1.60000	82.00000	-0.96558	1.9992	0.44152	-	-	- *
		43.20000	1.60000	82.00000	-0.99381	1.8131	0.32346	-	-	- *
		44.40000	1.60000	82.00000	-0.92268	1.5418	0.24749	-	-	- *
		45.60000	1.60000	82.00000	-0.82470	1.2751	0.20564	-	-	- *
		46.80000	1.60000	82.00000	-0.70613	1.0193	0.17001	-	-	- *
		48.00000	1.60000	82.00000	-0.55622	0.76454	0.13530	-	-	- *
		49.20000	1.60000	82.00000	-0.37720	0.51331	0.096555	-	-	- *
		50.40000	1.60000	82.00000	-0.21314	0.30063	0.054929	-	-	- *
		51.60000	1.60000	82.00000	-0.13518	0.17499	0.038414	-	-	- *
		52.80000	1.60000	82.00000	-0.045672	0.054633	0.016387	-	-	- *
		54.00000	1.60000	82.00000	0.0	0.0	0.0	-	-	- *
		55.20000	1.60000	82.00000	0.0	0.0	0.0	-	-	- *
		56.40000	1.60000	82.00000	0.0	0.0	0.0	-	-	- *
		57.60000	1.60000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	1.60000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	1.60000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	2.40000	82.00000	0.41178	0.36357	0.075758	-	-	- *
		1.20000	2.40000	82.00000	0.51869	0.48644	0.092642	-	-	- *
		2.40000	2.40000	82.00000	0.61024	0.61024	0.11253	-	-	- *
		3.60000	2.40000	82.00000	0.70601	0.75614	0.14144	-	-	- *
		4.80000	2.40000	82.00000	0.79012	0.91090	0.17840	-	-	- *
		6.00000	2.40000	82.00000	0.86068	1.0744	0.22426	-	-	- *
		7.20000	2.40000	82.00000	0.91564	1.2461	0.27913	-	-	- *
		8.40000	2.40000	82.00000	0.95280	1.4253	0.34246	-	-	- *
		9.60000	2.40000	82.00000	0.96990	1.6106	0.41315	-	-	- *
		10.80000	2.40000	82.00000	0.96470	1.8001	0.48952	-	-	- *
		12.00000	2.40000	82.00000	0.93517	1.9914	0.57038	-	-	- *
		13.20000	2.40000	82.00000	0.87965	2.1810	0.77147	-	-	- *
		14.40000	2.40000	82.00000	0.79712	2.3652	0.95517	-	-	- *
		15.60000	2.40000	82.00000	0.68745	2.5393	1.1176	-	-	- *
		16.80000	2.40000	82.00000	0.55160	2.6984	1.2548	-	-	- *
		18.00000	2.40000	82.00000	0.39187	2.8371	1.3634	-	-	- *
		19.20000	2.40000	82.00000	0.21193	2.9507	1.4402	-	-	- *
		20.40000	2.40000	82.00000	0.016766	3.0346	1.4827	-	-	- *
		21.60000	2.40000	82.00000	0.0	4.5375	1.9819	-	-	- *
		22.80000	2.40000	82.00000	0.0	4.5375	1.9819	-	-	- *
		24.00000	2.40000	82.00000	0.0	4.5375	1.9819	-	-	- *
		25.20000	2.40000	82.00000	0.0	4.5375	1.9819	-	-	- *
		26.40000	2.40000	82.00000	0.0	4.5375	1.9819	-	-	- *
		27.60000	2.40000	82.00000	-0.077700	3.8660	1.6366	-	-	- *
		28.80000	2.40000	82.00000	-0.15797	3.8307	1.6122	-	-	- *
		30.00000	2.40000	82.00000	-0.23274	3.7911	1.5814	-	-	- *
		31.20000	2.40000	82.00000	-0.30142	3.7483	1.5447	-	-	- *
		32.40000	2.40000	82.00000	-0.36369	3.7032	1.5028	-	-	- *
		33.60000	2.40000	82.00000	-0.41948	3.6569	1.4565	-	-	- *
		34.80000	2.40000	82.00000	-0.46894	3.6101	1.4067	-	-	- *
		36.00000	2.40000	82.00000	-0.51237	3.5637	1.3546	-	-	- *
		37.20000	2.40000	82.00000	-0.56927	2.6577	1.1319	-	-	- *
		38.40000	2.40000	82.00000	-0.71222	2.5587	1.0543	-	-	- *
		39.60000	2.40000	82.00000	-0.83978	2.4370	0.95312	-	-	- *
		40.80000	2.40000	82.00000	-0.94835	2.2964	0.83350	-	-	- *
		42.00000	2.40000	82.00000	-1.0354	2.1410	0.70158	-	-	- *
		43.20000	2.40000	82.00000	-1.0995	1.9750	0.56450	-	-	- *
		44.40000	2.40000	82.00000	-1.0798	1.7416	0.41264	-	-	- *
		45.60000	2.40000	82.00000	-0.99330	1.4715	0.24944	-	-	- *
		46.80000	2.40000	82.00000	-0.87432	1.2034	0.20489	-	-	- *
		48.00000	2.40000	82.00000	-0.72220	0.93785	0.16490	-	-	- *
		49.20000	2.40000	82.00000	-0.53956	0.67736	0.12527	-	-	- *
		50.40000	2.40000	82.00000	-0.32916	0.42396	0.079494	-	-	- *
		51.60000	2.40000	82.00000	-0.21497	0.26650	0.051831	-	-	- *
		52.80000	2.40000	82.00000	-0.12362	0.14161	0.033946	-	-	- *
		54.00000	2.40000	82.00000	-0.021905	0.023323	0.0091369	-	-	- *
		55.20000	2.40000	82.00000	0.0	0.0	0.0	-	-	- *
		56.40000	2.40000	82.00000	0.0	0.0	0.0	-	-	- *
		57.60000	2.40000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	2.40000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	2.40000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	3.20000	82.00000	0.50141	0.42314	0.086869	-	-	- *
		1.20000	3.20000	82.00000	0.61188	0.54847	0.10645	-	-	- *
		2.40000	3.20000	82.00000	0.70653	0.67530	0.13097	-	-	- *
		3.60000	3.20000	82.00000	0.79213	0.81088	0.16362	-	-	- *
		4.80000	3.20000	82.00000	0.87971	0.96936	0.20849	-	-	- *
		6.00000	3.20000	82.00000	0.95354	1.1377	0.26366	-	-	- *
		7.20000	3.20000	82.00000	1.0114	1.3155	0.32904	-	-	- *
		8.40000	3.20000	82.00000	1.0507	1.5022	0.40387	-	-	- *
		9.60000	3.20000	82.00000	1.0689	1.6966	0.48678	-	-	- *
		10.80000	3.20000	82.00000	1.0635	1.8967	0.61742	-	-	- *
		12.00000	3.20000	82.00000	1.0318	2.1001	0.84996	-	-	- *
		13.20000	3.20000	82.00000	0.97184	2.3031	1.0686	-	-	- *
		14.40000	3.20000	82.00000	0.88209	2.5017	1.2690	-	-	- *
		15.60000	3.20000	82.00000	0.76206	2.6905	1.4470	-	-	- *
		16.80000	3.20000	82.00000	0.61256	2.8641	1.5982	-	-	- *
		18.00000	3.20000	82.00000	0.43591	3.0165	1.7188	-	-	- *
		19.20000	3.20000	82.00000	0.23609	3.1418	1.8050	-	-	- *
		20.40000	3.20000	82.00000	0.018699	3.2349	1.8541	-	-	- *
		21.60000	3.20000	82.00000	0.0	4.8375	2.4384	-	-	- *
		22.80000	3.20000	82.00000	0.0	4.8375	2.4384	-	-	- *
		24.00000	3.20000	82.00000	0.0	4.8375	2.4384	-	-	- *
		25.20000	3.20000	82.00000	0.0	4.8375	2.4384	-	-	- *
		26.40000	3.20000	82.00000	0.0	4.8375	2.4384	-	-	- *
		27.60000	3.20000	82.00000	-0.081204	4.1646	2.0548	-	-	- *
		28.80000	3.20000	82.00000	-0.16483	4.1273	2.0284	-	-	- *
		30.00000	3.20000	82.00000	-0.24236	4.0855	1.9957	-	-	- *
		31.20000	3.20000	82.00000	-0.31317	4.0402	1.9572	-	-	- *
		32.40000	3.20000	82.00000	-0.37694	3.9928	1.9133	-	-	- *
		33.60000	3.20000	82.00000	-0.43363	3.9441	1.8647	-	-	- *
		34.80000	3.20000	82.00000	-0.48347	3.8952	1.8120	-	-	- *
		36.00000	3.20000	82.00000	-0.52684	3.8469	1.7564	-	-	- *
		37.20000	3.20000	82.00000	-0.58654	2.8393	1.4804	-	-	- *
		38.40000	3.20000	82.00000	-0.74717	2.7311	1.3924	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		39.60000	3.20000	82.00000	-0.89033	2.5985	1.2765	-	-	- *
		40.80000	3.20000	82.00000	-1.0120	2.4457	1.1381	-	-	- *
		42.00000	3.20000	82.00000	-1.1095	2.2777	0.98359	-	-	- *
		43.20000	3.20000	82.00000	-1.1813	2.0991	0.82062	-	-	- *
		44.40000	3.20000	82.00000	-1.2375	1.9245	0.65941	-	-	- *
		45.60000	3.20000	82.00000	-1.1694	1.6570	0.47425	-	-	- *
		46.80000	3.20000	82.00000	-1.0490	1.3763	0.27667	-	-	- *
		48.00000	3.20000	82.00000	-0.89369	1.0997	0.19863	-	-	- *
		49.20000	3.20000	82.00000	-0.70644	0.83004	0.15444	-	-	- *
		50.40000	3.20000	82.00000	-0.49045	0.56913	0.10903	-	-	- *
		51.60000	3.20000	82.00000	-0.29615	0.35092	0.063321	-	-	- *
		52.80000	3.20000	82.00000	-0.20251	0.22173	0.047019	-	-	- *
		54.00000	3.20000	82.00000	-0.098318	0.10005	0.027180	-	-	- *
		55.20000	3.20000	82.00000	0.0	0.0	0.0	-	-	- *
		56.40000	3.20000	82.00000	0.0	0.0	0.0	-	-	- *
		57.60000	3.20000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	3.20000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	3.20000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	4.00000	82.00000	0.59386	0.47798	0.098957	-	-	- *
		1.20000	4.00000	82.00000	0.70841	0.60564	0.12248	-	-	- *
		2.40000	4.00000	82.00000	0.80675	0.73543	0.15281	-	-	- *
		3.60000	4.00000	82.00000	0.88748	0.86648	0.19115	-	-	- *
		4.80000	4.00000	82.00000	0.96988	1.0193	0.24278	-	-	- *
		6.00000	4.00000	82.00000	1.0476	1.1921	0.30803	-	-	- *
		7.20000	4.00000	82.00000	1.1089	1.3757	0.38464	-	-	- *
		8.40000	4.00000	82.00000	1.1512	1.5698	0.47163	-	-	- *
		9.60000	4.00000	82.00000	1.1714	1.7732	0.62361	-	-	- *
		10.80000	4.00000	82.00000	1.1665	1.9842	0.88487	-	-	- *
		12.00000	4.00000	82.00000	1.1334	2.2002	1.1362	-	-	- *
		13.20000	4.00000	82.00000	1.0695	2.4175	1.3733	-	-	- *
		14.40000	4.00000	82.00000	0.97283	2.6314	1.5915	-	-	- *
		15.60000	4.00000	82.00000	0.84233	2.8364	1.7861	-	-	- *
		16.80000	4.00000	82.00000	0.67857	3.0261	1.9524	-	-	- *
		18.00000	4.00000	82.00000	0.48386	3.1934	2.0858	-	-	- *
		19.20000	4.00000	82.00000	0.26251	3.3318	2.1825	-	-	- *
		20.40000	4.00000	82.00000	0.020820	3.4352	2.2391	-	-	- *
		21.60000	4.00000	82.00000	0.0	5.1375	2.9152	-	-	- *
		22.80000	4.00000	82.00000	0.0	5.1375	2.9152	-	-	- *
		24.00000	4.00000	82.00000	0.0	5.1375	2.9152	-	-	- *
		25.20000	4.00000	82.00000	0.0	5.1375	2.9152	-	-	- *
		26.40000	4.00000	82.00000	0.0	5.1375	2.9152	-	-	- *
		27.60000	4.00000	82.00000	-0.085038	4.4631	2.4965	-	-	- *
		28.80000	4.00000	82.00000	-0.17230	4.4236	2.4682	-	-	- *
		30.00000	4.00000	82.00000	-0.25280	4.3793	2.4341	-	-	- *
		31.20000	4.00000	82.00000	-0.32583	4.3314	2.3943	-	-	- *
		32.40000	4.00000	82.00000	-0.39109	4.2812	2.3492	-	-	- *
		33.60000	4.00000	82.00000	-0.44862	4.2301	2.2993	-	-	- *
		34.80000	4.00000	82.00000	-0.49871	4.1789	2.2449	-	-	- *
		36.00000	4.00000	82.00000	-0.54188	4.1287	2.1869	-	-	- *
		37.20000	4.00000	82.00000	-0.60452	3.0193	1.8489	-	-	- *
		38.40000	4.00000	82.00000	-0.78437	2.9011	1.7509	-	-	- *
		39.60000	4.00000	82.00000	-0.94434	2.7565	1.6205	-	-	- *
		40.80000	4.00000	82.00000	-1.0799	2.5905	1.4632	-	-	- *
		42.00000	4.00000	82.00000	-1.1882	2.4086	1.2860	-	-	- *
		43.20000	4.00000	82.00000	-1.2714	2.2199	1.0977	-	-	- *
		44.40000	4.00000	82.00000	-1.3438	2.0421	0.90939	-	-	- *
		45.60000	4.00000	82.00000	-1.3532	1.8305	0.71972	-	-	- *
		46.80000	4.00000	82.00000	-1.2303	1.5367	0.50162	-	-	- *
		48.00000	4.00000	82.00000	-1.0706	1.2491	0.28096	-	-	- *
		49.20000	4.00000	82.00000	-0.87760	0.97040	0.18647	-	-	- *
		50.40000	4.00000	82.00000	-0.65499	0.70232	0.13788	-	-	- *
		51.60000	4.00000	82.00000	-0.40620	0.44597	0.085066	-	-	- *
		52.80000	4.00000	82.00000	-0.28209	0.29459	0.057773	-	-	- *
		54.00000	4.00000	82.00000	-0.17730	0.17208	0.040951	-	-	- *
		55.20000	4.00000	82.00000	-0.061560	0.055810	0.018348	-	-	- *
		56.40000	4.00000	82.00000	0.0	0.0	0.0	-	-	- *
		57.60000	4.00000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	4.00000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	4.00000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	4.80000	82.00000	0.68901	0.52768	0.11256	-	-	- *
		1.20000	4.80000	82.00000	0.80825	0.65748	0.14117	-	-	- *
		2.40000	4.80000	82.00000	0.91090	0.79012	0.17840	-	-	- *
		3.60000	4.80000	82.00000	0.99543	0.92474	0.22512	-	-	- *
		4.80000	4.80000	82.00000	1.0602	1.0602	0.28103	-	-	- *
		6.00000	4.80000	82.00000	1.1424	1.2370	0.35695	-	-	- *
		7.20000	4.80000	82.00000	1.2081	1.4261	0.44533	-	-	- *
		8.40000	4.80000	82.00000	1.2541	1.6272	0.58955	-	-	- *
		9.60000	4.80000	82.00000	1.2772	1.8396	0.87592	-	-	- *
		10.80000	4.80000	82.00000	1.2737	2.0616	1.1567	-	-	- *
		12.00000	4.80000	82.00000	1.2402	2.2906	1.4277	-	-	- *
		13.20000	4.80000	82.00000	1.1731	2.5230	1.6841	-	-	- *
		14.40000	4.80000	82.00000	1.0698	2.7535	1.9210	-	-	- *
		15.60000	4.80000	82.00000	0.92887	2.9762	2.1332	-	-	- *
		16.80000	4.80000	82.00000	0.75026	3.1835	2.3154	-	-	- *
		18.00000	4.80000	82.00000	0.53626	3.3677	2.4628	-	-	- *
		19.20000	4.80000	82.00000	0.29152	3.5207	2.5709	-	-	- *
		20.40000	4.80000	82.00000	0.023156	3.6355	2.6360	-	-	- *
		21.60000	4.80000	82.00000	0.0	5.4375	3.4098	-	-	- *
		22.80000	4.80000	82.00000	0.0	5.4375	3.4098	-	-	- *
		24.00000	4.80000	82.00000	0.0	5.4375	3.4098	-	-	- *
		25.20000	4.80000	82.00000	0.0	5.4375	3.4098	-	-	- *
		26.40000	4.80000	82.00000	0.0	5.4375	3.4098	-	-	- *
		27.60000	4.80000	82.00000	-0.089251	4.7614	2.9598	-	-	- *
		28.80000	4.80000	82.00000	-0.18048	4.7195	2.9301	-	-	- *
		30.00000	4.80000	82.00000	-0.26414	4.6723	2.8949	-	-	- *
		31.20000	4.80000	82.00000	-0.33948	4.6215	2.8546	-	-	- *
		32.40000	4.80000	82.00000	-0.40622	4.5685	2.8091	-	-	- *
		33.60000	4.80000	82.00000	-0.46448	4.5146	2.7587	-	-	- *
		34.80000	4.80000	82.00000	-0.51469	4.4611	2.7036	-	-	- *
		36.00000	4.80000	82.00000	-0.55747	4.4088	2.6444	-	-	- *
		37.20000	4.80000	82.00000	-0.62322	3.1975	2.2357	-	-	- *
		38.40000	4.80000	82.00000	-0.82406	3.0684	2.1280	-	-	- *
		39.60000	4.80000	82.00000	-1.0022	2.9106	1.9831	-	-	- *
		40.80000	4.80000	82.00000	-1.1526	2.7300	1.8068	-	-	- *
		42.00000	4.80000	82.00000	-1.2720	2.5330	1.6067	-	-	- *
		43.20000	4.80000	82.00000	-1.3782	2.3438	1.3959	-	-	- *
		44.40000	4.80000	82.00000	-1.4560	2.1511	1.1780	-	-	- *
		45.60000	4.80000	82.00000	-1.5031	1.9563	0.96336	-	-	- *
		46.80000	4.80000	82.00000	-1.4180	1.6834	0.73496	-	-	- *
		48.00000	4.80000	82.00000	-1.2526	1.3849	0.49370	-	-	- *
		49.20000	4.80000	82.00000	-1.0527	1.0974	0.25238	-	-	- *
		50.40000	4.80000	82.00000	-0.82239	0.82268	0.16810	-	-	- *
		51.60000	4.80000	82.00000	-0.56550	0.56144	0.11408	-	-	- *
		52.80000	4.80000	82.00000	-0.36307	0.36077	0.068113	-	-	- *
		54.00000	4.80000	82.00000	-0.26052	0.24060	0.052605	-	-	- *
		55.20000	4.80000	82.00000	-0.14122	0.12182	0.033777	-	-	- *
		56.40000	4.80000	82.00000	-0.0065579	0.0053071	0.0045518	-	-	- *
		57.60000	4.80000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	4.80000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	4.80000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	5.60000	82.00000	0.78672	0.57181	0.12809	-	-	- *
		1.20000	5.60000	82.00000	0.91126	0.70351	0.16285	-	-	- *
		2.40000	5.60000	82.00000	1.0189	0.83879	0.20797	-	-	- *
		3.60000	5.60000	82.00000	1.1080	0.97688	0.26398	-	-	- *
		4.80000	5.60000	82.00000	1.1767	1.1167	0.33022	-	-	- *
		6.00000	5.60000	82.00000	1.2376	1.2718	0.40983	-	-	- *
		7.20000	5.60000	82.00000	1.3083	1.4657	0.51719	-	-	- *
		8.40000	5.60000	82.00000	1.3591	1.6736	0.82436	-	-	- *
		9.60000	5.60000	82.00000	1.3861	1.8947	1.1304	-	-	- *
		10.80000	5.60000	82.00000	1.3852	2.1278	1.4313	-	-	- *
		12.00000	5.60000	82.00000	1.3522	2.3703	1.7225	-	-	- *
		13.20000	5.60000	82.00000	1.2828	2.6184	1.9990	-	-	- *
		14.40000	5.60000	82.00000	1.1737	2.8669	2.2553	-	-	- *
		15.60000	5.60000	82.00000	1.0223	3.1088	2.4859	-	-	- *
		16.80000	5.60000	82.00000	0.82835	3.3358	2.6851	-	-	- *
		18.00000	5.60000	82.00000	0.59374	3.5387	2.8475	-	-	- *
		19.20000	5.60000	82.00000	0.32370	3.7101	2.9680	-	-	- *
		20.40000	5.60000	82.00000	0.025817	3.8467	3.0425	-	-	- *
		21.60000	5.60000	82.00000	0.0	5.7486	3.9190	-	-	- *
		22.80000	5.60000	82.00000	0.0	5.7486	3.9190	-	-	- *
		24.00000	5.60000	82.00000	0.0	5.7486	3.9190	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		25.20000	5.60000	82.00000	0.0	5.7486	3.9190	-	-	- *
		26.40000	5.60000	82.00000	0.0	5.7486	3.9190	-	-	- *
		27.60000	5.60000	82.00000	-0.093901	5.0706	3.4425	-	-	- *
		28.80000	5.60000	82.00000	-0.18945	5.0260	3.4116	-	-	- *
		30.00000	5.60000	82.00000	-0.27650	4.9757	3.3759	-	-	- *
		31.20000	5.60000	82.00000	-0.35423	4.9216	3.3357	-	-	- *
		32.40000	5.60000	82.00000	-0.42241	4.8654	3.2906	-	-	- *
		33.60000	5.60000	82.00000	-0.48128	4.8086	3.2407	-	-	- *
		34.80000	5.60000	82.00000	-0.53140	4.7526	3.1859	-	-	- *
		36.00000	5.60000	82.00000	-0.57359	4.6983	3.1265	-	-	- *
		37.20000	5.60000	82.00000	-0.64281	3.3847	2.6387	-	-	- *
		38.40000	5.60000	82.00000	-0.86658	3.2333	2.5214	-	-	- *
		39.60000	5.60000	82.00000	-1.0644	3.0603	2.3619	-	-	- *
		40.80000	5.60000	82.00000	-1.2304	2.8635	2.1665	-	-	- *
		42.00000	5.60000	82.00000	-1.3733	2.6615	1.9476	-	-	- *
		43.20000	5.60000	82.00000	-1.4918	2.4588	1.7112	-	-	- *
		44.40000	5.60000	82.00000	-1.5745	2.2502	1.4631	-	-	- *
		45.60000	5.60000	82.00000	-1.6232	2.0412	1.2156	-	-	- *
		46.80000	5.60000	82.00000	-1.6120	1.8150	0.97687	-	-	- *
		48.00000	5.60000	82.00000	-1.4395	1.5058	0.71215	-	-	- *
		49.20000	5.60000	82.00000	-1.2313	1.2101	0.45112	-	-	- *
		50.40000	5.60000	82.00000	-0.99213	0.92933	0.20121	-	-	- *
		51.60000	5.60000	82.00000	-0.72613	0.66397	0.14293	-	-	- *
		52.80000	5.60000	82.00000	-0.45345	0.42762	0.080799	-	-	- *
		54.00000	5.60000	82.00000	-0.34724	0.30435	0.063438	-	-	- *
		55.20000	5.60000	82.00000	-0.22377	0.18319	0.046155	-	-	- *
		56.40000	5.60000	82.00000	-0.084582	0.064963	0.022372	-	-	- *
		57.60000	5.60000	82.00000	0.0	0.0	0.0	-	-	- *
		58.80000	5.60000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	5.60000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	6.40000	82.00000	0.88679	0.60994	0.14582	-	-	- *
		1.20000	6.40000	82.00000	1.0173	0.74320	0.18766	-	-	- *
		2.40000	6.40000	82.00000	1.1307	0.88084	0.24156	-	-	- *
		3.60000	6.40000	82.00000	1.2252	1.0222	0.30771	-	-	- *
		4.80000	6.40000	82.00000	1.2986	1.1663	0.38507	-	-	- *
		6.00000	6.40000	82.00000	1.3490	1.3117	0.47155	-	-	- *
		7.20000	6.40000	82.00000	1.4093	1.4940	0.73286	-	-	- *
		8.40000	6.40000	82.00000	1.4657	1.7079	1.0593	-	-	- *
		9.60000	6.40000	82.00000	1.4977	1.9374	1.3852	-	-	- *
		10.80000	6.40000	82.00000	1.5007	2.1814	1.7066	-	-	- *
		12.00000	6.40000	82.00000	1.4695	2.4377	2.0186	-	-	- *
		13.20000	6.40000	82.00000	1.3991	2.7024	2.3156	-	-	- *
		14.40000	6.40000	82.00000	1.2849	2.9700	2.5921	-	-	- *
		15.60000	6.40000	82.00000	1.1257	3.2394	2.8419	-	-	- *
		16.80000	6.40000	82.00000	0.92981	3.5433	3.0589	-	-	- *
		18.00000	6.40000	82.00000	0.67555	3.8101	3.2372	-	-	- *
		19.20000	6.40000	82.00000	0.37116	4.0257	3.3712	-	-	- *
		20.40000	6.40000	82.00000	0.029631	4.1779	3.4561	-	-	- *
		21.60000	6.40000	82.00000	0.0	6.1798	4.4389	-	-	- *
		22.80000	6.40000	82.00000	0.0	6.1798	4.4389	-	-	- *
		24.00000	6.40000	82.00000	0.0	6.1798	4.4389	-	-	- *
		25.20000	6.40000	82.00000	0.0	6.1798	4.4389	-	-	- *
		26.40000	6.40000	82.00000	0.0	6.1798	4.4389	-	-	- *
		27.60000	6.40000	82.00000	-0.099061	5.4996	3.9414	-	-	- *
		28.80000	6.40000	82.00000	-0.19935	5.4519	3.9095	-	-	- *
		30.00000	6.40000	82.00000	-0.29002	5.3982	3.8739	-	-	- *
		31.20000	6.40000	82.00000	-0.37021	5.3405	3.8344	-	-	- *
		32.40000	6.40000	82.00000	-0.43975	5.2808	3.7906	-	-	- *
		33.60000	6.40000	82.00000	-0.49904	5.2209	3.7421	-	-	- *
		34.80000	6.40000	82.00000	-0.54885	5.1622	3.6886	-	-	- *
		36.00000	6.40000	82.00000	-0.59020	5.1058	3.6301	-	-	- *
		37.20000	6.40000	82.00000	-0.66484	3.6900	3.0553	-	-	- *
		38.40000	6.40000	82.00000	-0.92502	3.5238	2.9283	-	-	- *
		39.60000	6.40000	82.00000	-1.1500	3.3061	2.7541	-	-	- *
		40.80000	6.40000	82.00000	-1.3338	3.0517	2.5416	-	-	- *
		42.00000	6.40000	82.00000	-1.4867	2.7865	2.3047	-	-	- *
		43.20000	6.40000	82.00000	-1.6128	2.5638	2.0411	-	-	- *
		44.40000	6.40000	82.00000	-1.6994	2.3381	1.7624	-	-	- *
		45.60000	6.40000	82.00000	-1.7488	2.1144	1.4818	-	-	- *
		46.80000	6.40000	82.00000	-1.7649	1.8974	1.2128	-	-	- *
		48.00000	6.40000	82.00000	-1.6307	1.6106	0.93617	-	-	- *
		49.20000	6.40000	82.00000	-1.4129	1.3074	0.65283	-	-	- *
		50.40000	6.40000	82.00000	-1.1636	1.0214	0.37522	-	-	- *
		51.60000	6.40000	82.00000	-0.89701	0.76209	0.17480	-	-	- *
		52.80000	6.40000	82.00000	-0.61483	0.52487	0.11420	-	-	- *
		54.00000	6.40000	82.00000	-0.43741	0.36279	0.074675	-	-	- *
		55.20000	6.40000	82.00000	-0.30908	0.23945	0.056878	-	-	- *
		56.40000	6.40000	82.00000	-0.16478	0.11976	0.036345	-	-	- *
		57.60000	6.40000	82.00000	-0.0061214	0.0041899	0.0044367	-	-	- *
		58.80000	6.40000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	6.40000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	7.20000	82.00000	0.98895	0.64161	0.16588	-	-	- *
		1.20000	7.20000	82.00000	1.1261	0.77602	0.21565	-	-	- *
		2.40000	7.20000	82.00000	1.2461	0.91564	0.27913	-	-	- *
		3.60000	7.20000	82.00000	1.3468	1.0599	0.35616	-	-	- *
		4.80000	7.20000	82.00000	1.4261	1.2081	0.44533	-	-	- *
		6.00000	7.20000	82.00000	1.4813	1.3588	0.62515	-	-	- *
		7.20000	7.20000	82.00000	1.5102	1.5102	0.94683	-	-	- *
		8.40000	7.20000	82.00000	1.5733	1.7294	1.2925	-	-	- *
		9.60000	7.20000	82.00000	1.6117	1.9665	1.6386	-	-	- *
		10.80000	7.20000	82.00000	1.6199	2.2211	1.9807	-	-	- *
		12.00000	7.20000	82.00000	1.5922	2.4912	2.3135	-	-	- *
		13.20000	7.20000	82.00000	1.5222	2.7733	2.6316	-	-	- *
		14.40000	7.20000	82.00000	1.4269	3.1110	2.9286	-	-	- *
		15.60000	7.20000	82.00000	1.2782	3.4694	3.1981	-	-	- *
		16.80000	7.20000	82.00000	1.0587	3.8055	3.4337	-	-	- *
		18.00000	7.20000	82.00000	0.77115	4.1025	3.6288	-	-	- *
		19.20000	7.20000	82.00000	0.42456	4.3436	3.7774	-	-	- *
		20.40000	7.20000	82.00000	0.033938	4.5137	3.8739	-	-	- *
		21.60000	7.20000	82.00000	0.0	6.6157	4.9652	-	-	- *
		22.80000	7.20000	82.00000	0.0	6.6157	4.9652	-	-	- *
		24.00000	7.20000	82.00000	0.0	6.6157	4.9652	-	-	- *
		25.20000	7.20000	82.00000	0.0	6.6157	4.9652	-	-	- *
		26.40000	7.20000	82.00000	0.0	6.6157	4.9652	-	-	- *
		27.60000	7.20000	82.00000	-0.10482	5.9331	4.4524	-	-	- *
		28.80000	7.20000	82.00000	-0.21032	5.8819	4.4199	-	-	- *
		30.00000	7.20000	82.00000	-0.30485	5.8242	4.3849	-	-	- *
		31.20000	7.20000	82.00000	-0.38754	5.7624	4.3468	-	-	- *
		32.40000	7.20000	82.00000	-0.45833	5.6989	4.3051	-	-	- *
		33.60000	7.20000	82.00000	-0.51781	5.6357	4.2589	-	-	- *
		34.80000	7.20000	82.00000	-0.56702	5.5743	4.2077	-	-	- *
		36.00000	7.20000	82.00000	-0.60722	5.5158	4.1512	-	-	- *
		37.20000	7.20000	82.00000	-0.68787	3.9977	3.4824	-	-	- *
		38.40000	7.20000	82.00000	-0.98898	3.8148	3.3456	-	-	- *
		39.60000	7.20000	82.00000	-1.2489	3.5743	3.1564	-	-	- *
		40.80000	7.20000	82.00000	-1.4781	3.3099	2.9345	-	-	- *
		42.00000	7.20000	82.00000	-1.6513	3.0152	2.6737	-	-	- *
		43.20000	7.20000	82.00000	-1.7618	2.7004	2.3823	-	-	- *
		44.40000	7.20000	82.00000	-1.8309	2.4134	2.0729	-	-	- *
		45.60000	7.20000	82.00000	-1.8796	2.1744	1.7590	-	-	- *
		46.80000	7.20000	82.00000	-1.8926	1.9451	1.4548	-	-	- *
		48.00000	7.20000	82.00000	-1.8257	1.6979	1.1651	-	-	- *
		49.20000	7.20000	82.00000	-1.5966	1.3881	0.85722	-	-	- *
		50.40000	7.20000	82.00000	-1.3386	1.1006	0.56004	-	-	- *
		51.60000	7.20000	82.00000	-1.0780	0.85413	0.27348	-	-	- *
		52.80000	7.20000	82.00000	-0.78534	0.61450	0.14568	-	-	- *
		54.00000	7.20000	82.00000	-0.53092	0.41537	0.087276	-	-	- *
		55.20000	7.20000	82.00000	-0.39701	0.29012	0.067080	-	-	- *
		56.40000	7.20000	82.00000	-0.24694	0.16929	0.047785	-	-	- *
		57.60000	7.20000	82.00000	-0.082484	0.053254	0.021170	-	-	- *
		58.80000	7.20000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	7.20000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	8.00000	82.00000	1.0929	0.66640	0.18831	-	-	- *
		1.20000	8.00000	82.00000	1.2374	0.80143	0.24673	-	-	- *
		2.40000	8.00000	82.00000	1.3648	0.94253	0.32047	-	-	- *
		3.60000	8.00000	82.00000	1.4728	1.0893	0.40903	-	-	- *
		4.80000	8.00000	82.00000	1.5589	1.2411	0.51061	-	-	- *
		6.00000	8.00000	82.00000	1.6203	1.3968	0.83622	-	-	- *
		7.20000	8.00000	82.00000	1.6543	1.5548	1.1771	-	-	- *
		8.40000	8.00000	82.00000	1.6814	1.7369	1.5224	-	-	- *
		9.60000	8.00000	82.00000	1.7274	1.9809	1.8884	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line	
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line
		10.80000	8.00000	82.00000	1.7425	2.2455	2.2510	-	-
		12.00000	8.00000	82.00000	1.7199	2.5293	2.6048	-	-
		13.20000	8.00000	82.00000	1.6926	2.8983	2.9438	-	-
		14.40000	8.00000	82.00000	1.6083	3.2956	3.2616	-	-
		15.60000	8.00000	82.00000	1.4461	3.6889	3.5514	-	-
		16.80000	8.00000	82.00000	1.2022	4.0615	3.8062	-	-
		18.00000	8.00000	82.00000	0.87868	4.3934	4.0190	-	-
		19.20000	8.00000	82.00000	0.48506	4.6640	4.1831	-	-
		20.40000	8.00000	82.00000	0.038838	4.8548	4.2925	-	-
		21.60000	8.00000	82.00000	0.0	7.0569	5.4929	-	-
		22.80000	8.00000	82.00000	0.0	7.0569	5.4929	-	-
		24.00000	8.00000	82.00000	0.0	7.0569	5.4929	-	-
		25.20000	8.00000	82.00000	0.0	7.0569	5.4929	-	-
		26.40000	8.00000	82.00000	0.0	7.0569	5.4929	-	-
		27.60000	8.00000	82.00000	-0.11128	6.3715	4.9709	-	-
		28.80000	8.00000	82.00000	-0.22253	6.3163	4.9382	-	-
		30.00000	8.00000	82.00000	-0.32120	6.2541	4.9043	-	-
		31.20000	8.00000	82.00000	-0.40639	6.1878	4.8684	-	-
		32.40000	8.00000	82.00000	-0.47822	6.1201	4.8295	-	-
		33.60000	8.00000	82.00000	-0.53759	6.0534	4.7865	-	-
		34.80000	8.00000	82.00000	-0.58585	5.9893	4.7385	-	-
		36.00000	8.00000	82.00000	-0.62457	5.9287	4.6850	-	-
		37.20000	8.00000	82.00000	-0.71197	4.3082	3.9166	-	-
		38.40000	8.00000	82.00000	-1.0594	4.1064	3.7696	-	-
		39.60000	8.00000	82.00000	-1.3726	3.8534	3.5751	-	-
		40.80000	8.00000	82.00000	-1.6373	3.5612	3.3360	-	-
		42.00000	8.00000	82.00000	-1.8311	3.2331	3.0508	-	-
		43.20000	8.00000	82.00000	-1.9528	2.8865	2.7315	-	-
		44.40000	8.00000	82.00000	-2.0059	2.5360	2.3913	-	-
		45.60000	8.00000	82.00000	-2.0156	2.2197	2.0442	-	-
		46.80000	8.00000	82.00000	-2.0238	1.9782	1.7051	-	-
		48.00000	8.00000	82.00000	-2.0000	1.7526	1.3891	-	-
		49.20000	8.00000	82.00000	-1.7816	1.4511	1.0635	-	-
		50.40000	8.00000	82.00000	-1.5358	1.1840	0.75070	-	-
		51.60000	8.00000	82.00000	-1.2640	0.93421	0.44616	-	-
		52.80000	8.00000	82.00000	-0.95959	0.69282	0.17878	-	-
		54.00000	8.00000	82.00000	-0.62759	0.46146	0.10195	-	-
		55.20000	8.00000	82.00000	-0.48731	0.33469	0.077651	-	-
		56.40000	8.00000	82.00000	-0.33081	0.21315	0.057768	-	-
		57.60000	8.00000	82.00000	-0.15999	0.097082	0.034485	-	-
		58.80000	8.00000	82.00000	0.0	0.0	0.0	-	-
		60.00000	8.00000	82.00000	0.0	0.0	0.0	-	-
		0.00000	8.80000	82.00000	1.1982	0.68385	0.21303	-	-
		1.20000	8.80000	82.00000	1.3508	0.81888	0.28071	-	-
		2.40000	8.80000	82.00000	1.4864	0.96084	0.36528	-	-
		3.60000	8.80000	82.00000	1.6027	1.1095	0.46591	-	-
		4.80000	8.80000	82.00000	1.6968	1.2645	0.68539	-	-
		6.00000	8.80000	82.00000	1.7659	1.4249	1.0475	-	-
		7.20000	8.80000	82.00000	1.8064	1.5891	1.4081	-	-
		8.40000	8.80000	82.00000	1.8151	1.7551	1.7607	-	-
		9.60000	8.80000	82.00000	1.8439	1.9792	2.1324	-	-
		10.80000	8.80000	82.00000	1.8677	2.2528	2.5152	-	-
		12.00000	8.80000	82.00000	1.9009	2.6165	2.8895	-	-
		13.20000	8.80000	82.00000	1.8920	3.0323	3.2494	-	-
		14.40000	8.80000	82.00000	1.8056	3.4633	3.5879	-	-
		15.60000	8.80000	82.00000	1.6314	3.8954	3.8981	-	-
		16.80000	8.80000	82.00000	1.3628	4.3095	4.1726	-	-
		18.00000	8.80000	82.00000	1.0004	4.6819	4.4039	-	-
		19.20000	8.80000	82.00000	0.55412	4.9871	4.5846	-	-
		20.40000	8.80000	82.00000	0.044459	5.2017	4.7091	-	-
		21.60000	8.80000	82.00000	0.0	7.5043	6.0162	-	-
		22.80000	8.80000	82.00000	0.0	7.5043	6.0162	-	-
		24.00000	8.80000	82.00000	0.0	7.5043	6.0162	-	-
		25.20000	8.80000	82.00000	0.0	7.5043	6.0162	-	-
		26.40000	8.80000	82.00000	0.0	7.5043	6.0162	-	-
		27.60000	8.80000	82.00000	-0.11859	6.8156	5.4913	-	-
		28.80000	8.80000	82.00000	-0.23621	6.7558	5.4589	-	-
		30.00000	8.80000	82.00000	-0.33928	6.6884	5.4267	-	-
		31.20000	8.80000	82.00000	-0.42691	6.6170	5.3936	-	-
		32.40000	8.80000	82.00000	-0.49951	6.5448	5.3583	-	-
		33.60000	8.80000	82.00000	-0.55836	6.4744	5.3193	-	-
		34.80000	8.80000	82.00000	-0.60526	6.4075	5.2755	-	-
		36.00000	8.80000	82.00000	-0.64210	6.3450	5.2258	-	-
		37.20000	8.80000	82.00000	-0.73718	4.6220	4.3539	-	-
		38.40000	8.80000	82.00000	-1.1426	4.4035	4.2004	-	-
		39.60000	8.80000	82.00000	-1.5156	4.1331	4.0017	-	-
		40.80000	8.80000	82.00000	-1.8134	3.8037	3.7419	-	-
		42.00000	8.80000	82.00000	-2.0280	3.4378	3.4321	-	-
		43.20000	8.80000	82.00000	-2.1594	3.0560	3.0847	-	-
		44.40000	8.80000	82.00000	-2.2135	2.6751	2.7138	-	-
		45.60000	8.80000	82.00000	-2.1995	2.3070	2.3339	-	-
		46.80000	8.80000	82.00000	-2.1579	1.9953	1.9603	-	-
		48.00000	8.80000	82.00000	-2.1265	1.7617	1.6086	-	-
		49.20000	8.80000	82.00000	-1.9867	1.5144	1.2770	-	-
		50.40000	8.80000	82.00000	-1.7392	1.2535	0.94342	-	-
		51.60000	8.80000	82.00000	-1.4546	1.0013	0.61869	-	-
		52.80000	8.80000	82.00000	-1.1370	0.75894	0.29916	-	-
		54.00000	8.80000	82.00000	-0.79041	0.52736	0.13642	-	-
		55.20000	8.80000	82.00000	-0.57969	0.37266	0.089247	-	-
		56.40000	8.80000	82.00000	-0.41607	0.25093	0.067143	-	-
		57.60000	8.80000	82.00000	-0.23831	0.13535	0.045424	-	-
		58.80000	8.80000	82.00000	-0.048165	0.025850	0.013742	-	-
		60.00000	8.80000	82.00000	0.0	0.0	0.0	-	-
		0.00000	9.60000	82.00000	1.3044	0.69357	0.23984	-	-
		1.20000	9.60000	82.00000	1.4658	0.82785	0.31729	-	-
		2.40000	9.60000	82.00000	1.6106	0.96990	0.41315	-	-
		3.60000	9.60000	82.00000	1.7361	1.1198	0.52628	-	-
		4.80000	9.60000	82.00000	1.8396	1.2772	0.87592	-	-
		6.00000	9.60000	82.00000	1.9177	1.4416	1.2579	-	-
		7.20000	9.60000	82.00000	1.9665	1.6117	1.6386	-	-
		8.40000	9.60000	82.00000	1.9822	1.7856	2.0113	-	-
		9.60000	9.60000	82.00000	1.9602	1.9602	2.3680	-	-
		10.80000	9.60000	82.00000	2.0354	2.2872	2.7703	-	-
		12.00000	9.60000	82.00000	2.1052	2.6995	3.1647	-	-
		13.20000	9.60000	82.00000	2.1052	3.1434	3.5448	-	-
		14.40000	9.60000	82.00000	2.0204	3.6103	3.9038	-	-
		15.60000	9.60000	82.00000	1.8366	4.0854	4.2344	-	-
		16.80000	9.60000	82.00000	1.5435	4.5469	4.5288	-	-
		18.00000	9.60000	82.00000	1.1391	4.9666	4.7791	-	-
		19.20000	9.60000	82.00000	0.63360	5.3125	4.9776	-	-
		20.40000	9.60000	82.00000	0.050965	5.5552	5.1166	-	-
		21.60000	9.60000	82.00000	0.0	7.9584	6.5291	-	-
		22.80000	9.60000	82.00000	0.0	7.9584	6.5291	-	-
		24.00000	9.60000	82.00000	0.0	7.9584	6.5291	-	-
		25.20000	9.60000	82.00000	0.0	7.9584	6.5291	-	-
		26.40000	9.60000	82.00000	0.0	7.9584	6.5291	-	-
		27.60000	9.60000	82.00000	-0.12692	7.2660	6.0076	-	-
		28.80000	9.60000	82.00000	-0.25162	7.2008	5.9758	-	-
		30.00000	9.60000	82.00000	-0.35934	7.1274	5.9458	-	-
		31.20000	9.60000	82.00000	-0.44927	7.0503	5.9162	-	-
		32.40000	9.60000	82.00000	-0.52224	6.9732	5.8853	-	-
		33.60000	9.60000	82.00000	-0.58008	6.8989	5.8512	-	-
		34.80000	9.60000	82.00000	-0.62510	6.8293	5.8122	-	-
		36.00000	9.60000	82.00000	-0.65961	6.7652	5.7672	-	-
		37.20000	9.60000	82.00000	-0.76357	4.9395	4.7897	-	-
		38.40000	9.60000	82.00000	-1.2521	4.7159	4.6441	-	-
		39.60000	9.60000	82.00000	-1.6758	4.4075	4.4286	-	-
		40.80000	9.60000	82.00000	-2.0091	4.0350	4.1475	-	-
		42.00000	9.60000	82.00000	-2.2440	3.6262	3.8127	-	-
		43.20000	9.60000	82.00000	-2.3827	3.2056	3.4375	-	-
		44.40000	9.60000	82.00000	-2.4345	2.7921	3.0363	-	-
		45.60000	9.60000	82.00000	-2.4118	2.3986	2.6242	-	-
		46.80000	9.60000	82.00000	-2.3278	2.0323	2.2170	-	-
		48.00000	9.60000	82.00000	-2.2583	1.7594	1.8328	-	-
		49.20000	9.60000	82.00000	-2.2098	1.5725	1.4971	-	-
		50.40000	9.60000	82.00000	-1.9483	1.3080	1.1377	-	-
		51.60000	9.60000	82.00000	-1.6492	1.0542	0.79082	-	-
		52.80000	9.60000	82.00000	-1.3170	0.81199	0.45379	-	-
		54.00000	9.60000	82.00000	-0.95609	0.58196	0.16814	-	-
		55.20000	9.60000	82.00000	-0.67374	0.40350	0.10231	-	-
		56.40000	9.60000	82.00000	-0.50231	0.28223	0.076548	-	-

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		57.60000	9.60000	82.00000	-0.31705	0.16776	0.054823	-	-	- *
		58.80000	9.60000	82.00000	-0.11977	0.059885	0.027081	-	-	- *
		60.00000	9.60000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	10.40000	82.00000	1.4110	0.69517	0.26848	-	-	- *
		1.20000	10.40000	82.00000	1.5819	0.82782	0.35606	-	-	- *
		2.40000	10.40000	82.00000	1.7366	0.96904	0.46355	-	-	- *
		3.60000	10.40000	82.00000	1.8726	1.1191	0.66749	-	-	- *
		4.80000	10.40000	82.00000	1.9867	1.2781	1.0640	-	-	- *
		6.00000	10.40000	82.00000	2.0754	1.4456	1.4661	-	-	- *
		7.20000	10.40000	82.00000	2.1344	1.6209	1.8674	-	-	- *
		8.40000	10.40000	82.00000	2.1592	1.8023	2.2605	-	-	- *
		9.60000	10.40000	82.00000	2.1574	1.9991	2.6368	-	-	- *
		10.80000	10.40000	82.00000	2.2317	2.3237	3.0137	-	-	- *
		12.00000	10.40000	82.00000	2.3188	2.7553	3.4271	-	-	- *
		13.20000	10.40000	82.00000	2.3325	3.2272	3.8267	-	-	- *
		14.40000	10.40000	82.00000	2.2540	3.7320	4.2054	-	-	- *
		15.60000	10.40000	82.00000	2.0641	4.2546	4.5559	-	-	- *
		16.80000	10.40000	82.00000	1.7475	4.7703	4.8702	-	-	- *
		18.00000	10.40000	82.00000	1.2983	5.2453	5.1401	-	-	- *
		19.20000	10.40000	82.00000	0.72593	5.6399	5.3573	-	-	- *
		20.40000	10.40000	82.00000	0.058573	5.9159	5.5133	-	-	- *
		21.60000	10.40000	82.00000	0.0	8.4200	7.0247	-	-	- *
		22.80000	10.40000	82.00000	0.0	8.4200	7.0247	-	-	- *
		24.00000	10.40000	82.00000	0.0	8.4200	7.0247	-	-	- *
		25.20000	10.40000	82.00000	0.0	8.4200	7.0247	-	-	- *
		26.40000	10.40000	82.00000	0.0	8.4200	7.0247	-	-	- *
		27.60000	10.40000	82.00000	-0.13650	7.7233	6.5126	-	-	- *
		28.80000	10.40000	82.00000	-0.26911	7.6517	6.4819	-	-	- *
		30.00000	10.40000	82.00000	-0.38169	7.5714	6.4547	-	-	- *
		31.20000	10.40000	82.00000	-0.47366	7.4878	6.4293	-	-	- *
		32.40000	10.40000	82.00000	-0.54645	7.4054	6.4034	-	-	- *
		33.60000	10.40000	82.00000	-0.60263	7.3272	6.3749	-	-	- *
		34.80000	10.40000	82.00000	-0.64516	7.2550	6.3415	-	-	- *
		36.00000	10.40000	82.00000	-0.67686	7.1896	6.3019	-	-	- *
		37.20000	10.40000	82.00000	-0.80897	5.2779	5.2364	-	-	- *
		38.40000	10.40000	82.00000	-1.3760	5.0278	5.0834	-	-	- *
		39.60000	10.40000	82.00000	-1.8567	4.6744	4.8502	-	-	- *
		40.80000	10.40000	82.00000	-2.2276	4.2517	4.5475	-	-	- *
		42.00000	10.40000	82.00000	-2.4814	3.7941	4.1878	-	-	- *
		43.20000	10.40000	82.00000	-2.6241	3.3309	3.7851	-	-	- *
		44.40000	10.40000	82.00000	-2.6692	2.8834	3.3543	-	-	- *
		45.60000	10.40000	82.00000	-2.6336	2.4644	2.9111	-	-	- *
		46.80000	10.40000	82.00000	-2.5335	2.0806	2.4715	-	-	- *
		48.00000	10.40000	82.00000	-2.4349	1.7807	2.0751	-	-	- *
		49.20000	10.40000	82.00000	-2.4092	1.5993	1.7094	-	-	- *
		50.40000	10.40000	82.00000	-2.1624	1.3460	1.3325	-	-	- *
		51.60000	10.40000	82.00000	-1.8469	1.0918	0.96197	-	-	- *
		52.80000	10.40000	82.00000	-1.4987	0.85108	0.60574	-	-	- *
		54.00000	10.40000	82.00000	-1.1223	0.62391	0.25746	-	-	- *
		55.20000	10.40000	82.00000	-0.76898	0.42674	0.11707	-	-	- *
		56.40000	10.40000	82.00000	-0.58906	0.30667	0.086424	-	-	- *
		57.60000	10.40000	82.00000	-0.39576	0.19404	0.063328	-	-	- *
		58.80000	10.40000	82.00000	-0.19092	0.088452	0.037998	-	-	- *
		60.00000	10.40000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	11.20000	82.00000	1.5173	0.68831	0.29858	-	-	- *
		1.20000	11.20000	82.00000	1.6983	0.81833	0.39654	-	-	- *
		2.40000	11.20000	82.00000	1.8638	0.95765	0.51590	-	-	- *
		3.60000	11.20000	82.00000	2.0112	1.1068	0.83242	-	-	- *
		4.80000	11.20000	82.00000	2.1373	1.2661	1.2483	-	-	- *
		6.00000	11.20000	82.00000	2.2383	1.4356	1.6708	-	-	- *
		7.20000	11.20000	82.00000	2.3096	1.6150	2.0929	-	-	- *
		8.40000	11.20000	82.00000	2.3459	1.8031	2.5067	-	-	- *
		9.60000	11.20000	82.00000	2.4208	2.0655	2.9030	-	-	- *
		10.80000	11.20000	82.00000	2.4729	2.3710	3.2721	-	-	- *
		12.00000	11.20000	82.00000	2.5407	2.7798	3.6736	-	-	- *
		13.20000	11.20000	82.00000	2.5737	3.2788	4.0913	-	-	- *
		14.40000	11.20000	82.00000	2.5074	3.8228	4.4887	-	-	- *
		15.60000	11.20000	82.00000	2.3167	4.3970	4.8583	-	-	- *
		16.80000	11.20000	82.00000	1.9791	4.9745	5.1921	-	-	- *
		18.00000	11.20000	82.00000	1.4825	5.5151	5.4818	-	-	- *
		19.20000	11.20000	82.00000	0.83429	5.9684	5.7186	-	-	- *
		20.40000	11.20000	82.00000	0.067575	6.2845	5.8993	-	-	- *
		21.60000	11.20000	82.00000	0.0	8.8898	7.4956	-	-	- *
		22.80000	11.20000	82.00000	0.0	8.8898	7.4956	-	-	- *
		24.00000	11.20000	82.00000	0.0	8.8898	7.4956	-	-	- *
		25.20000	11.20000	82.00000	0.0	8.8898	7.4956	-	-	- *
		26.40000	11.20000	82.00000	0.0	8.8898	7.4956	-	-	- *
		27.60000	11.20000	82.00000	-0.14763	8.1879	6.9987	-	-	- *
		28.80000	11.20000	82.00000	-0.28910	8.1087	6.9694	-	-	- *
		30.00000	11.20000	82.00000	-0.40667	8.0203	6.9456	-	-	- *
		31.20000	11.20000	82.00000	-0.50021	7.9295	6.9250	-	-	- *
		32.40000	11.20000	82.00000	-0.57207	7.8415	6.9048	-	-	- *
		33.60000	11.20000	82.00000	-0.62580	7.7595	6.8825	-	-	- *
		34.80000	11.20000	82.00000	-0.66516	7.6851	6.8554	-	-	- *
		36.00000	11.20000	82.00000	-0.69993	7.6249	6.8286	-	-	- *
		37.20000	11.20000	82.00000	-0.86498	5.6263	5.6797	-	-	- *
		38.40000	11.20000	82.00000	-1.5172	5.3378	5.5125	-	-	- *
		39.60000	11.20000	82.00000	-2.0621	4.9306	5.2607	-	-	- *
		40.80000	11.20000	82.00000	-2.4722	4.4489	4.9360	-	-	- *
		42.00000	11.20000	82.00000	-2.7426	3.9360	4.5518	-	-	- *
		43.20000	11.20000	82.00000	-2.8844	3.4268	4.1224	-	-	- *
		44.40000	11.20000	82.00000	-2.9174	2.9441	3.6633	-	-	- *
		45.60000	11.20000	82.00000	-2.8637	2.5007	3.1903	-	-	- *
		46.80000	11.20000	82.00000	-2.7788	2.1350	2.7397	-	-	- *
		48.00000	11.20000	82.00000	-2.6831	1.8386	2.3205	-	-	- *
		49.20000	11.20000	82.00000	-2.5811	1.5948	1.9196	-	-	- *
		50.40000	11.20000	82.00000	-2.3805	1.3660	1.5267	-	-	- *
		51.60000	11.20000	82.00000	-2.0469	1.1131	1.1312	-	-	- *
		52.80000	11.20000	82.00000	-1.6812	0.87538	0.75448	-	-	- *
		54.00000	11.20000	82.00000	-1.2880	0.65259	0.39065	-	-	- *
		55.20000	11.20000	82.00000	-0.87144	0.44406	0.13893	-	-	- *
		56.40000	11.20000	82.00000	-0.67575	0.32394	0.097033	-	-	- *
		57.60000	11.20000	82.00000	-0.47390	0.21395	0.071408	-	-	- *
		58.80000	11.20000	82.00000	-0.26112	0.11140	0.047164	-	-	- *
		60.00000	11.20000	82.00000	-0.038952	0.015750	0.011528	-	-	- *
		0.00000	12.00000	82.00000	1.6225	0.67275	0.32973	-	-	- *
		1.20000	12.00000	82.00000	1.8142	0.79901	0.43819	-	-	- *
		2.40000	12.00000	82.00000	1.9914	0.93517	0.57038	-	-	- *
		3.60000	12.00000	82.00000	2.1513	1.0820	0.99234	-	-	- *
		4.80000	12.00000	82.00000	2.2906	1.2402	1.4277	-	-	- *
		6.00000	12.00000	82.00000	2.4056	1.4102	1.8705	-	-	- *
		7.20000	12.00000	82.00000	2.4912	1.5922	2.3135	-	-	- *
		8.40000	12.00000	82.00000	2.5659	1.8025	2.7482	-	-	- *
		9.60000	12.00000	82.00000	2.6995	2.1052	3.1647	-	-	- *
		10.80000	12.00000	82.00000	2.7717	2.4288	3.5526	-	-	- *
		12.00000	12.00000	82.00000	2.7687	2.7687	3.9010	-	-	- *
		13.20000	12.00000	82.00000	2.8276	3.2924	4.3351	-	-	- *
		14.40000	12.00000	82.00000	2.7812	3.8754	4.7495	-	-	- *
		15.60000	12.00000	82.00000	2.5970	4.5051	5.1368	-	-	- *
		16.80000	12.00000	82.00000	2.2430	5.1528	5.4893	-	-	- *
		18.00000	12.00000	82.00000	1.6974	5.7711	5.7987	-	-	- *
		19.20000	12.00000	82.00000	0.96297	6.2964	6.0560	-	-	- *
		20.40000	12.00000	82.00000	0.078372	6.6616	6.2512	-	-	- *
		21.60000	12.00000	82.00000	0.0	9.3685	7.9337	-	-	- *
		22.80000	12.00000	82.00000	0.0	9.3685	7.9337	-	-	- *
		24.00000	12.00000	82.00000	0.0	9.3685	7.9337	-	-	- *
		25.20000	12.00000	82.00000	0.0	9.3685	7.9337	-	-	- *
		26.40000	12.00000	82.00000	0.0	9.3685	7.9337	-	-	- *
		27.60000	12.00000	82.00000	-0.16071	8.6603	7.4573	-	-	- *
		28.80000	12.00000	82.00000	-0.31212	8.5719	7.4299	-	-	- *
		30.00000	12.00000	82.00000	-0.43468	8.4741	7.4099	-	-	- *
		31.20000	12.00000	82.00000	-0.52905	8.3753	7.3947	-	-	- *
		32.40000	12.00000	82.00000	-0.59895	8.2814	7.3808	-	-	- *
		33.60000	12.00000	82.00000	-0.64926	8.1958	7.3652	-	-	- *
		34.80000	12.00000	82.00000	-0.68468	8.1197	7.3450	-	-	- *
		36.00000	12.00000	82.00000	-0.74407	8.0842	7.3537	-	-	- *
		37.20000	12.00000	82.00000	-0.92684	5.9789	6.1079	-	-	- *
		38.40000	12.00000	82.00000	-1.6797	5.6439	5.9248	-	-	- *
		39.60000	12.00000	82.00000	-2.2970	5.1716	5.6536	-	-	- *
		40.80000	12.00000	82.00000	-2.7473	4.6203	5.3069	-	-	- *
		42.00000	12.00000	82.00000	-3.0297	4.0451	4.8988	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line Along the Line	Angle of Line Perpendicular to Line	x Axis	
Name	Dist.	x	y	z	x	y	z				
		43.20000	12.00000	82.00000	-3.1639	3.4867	4.4441	-	-	-	*
		44.40000	12.00000	82.00000	-3.1781	2.9692	3.9582	-	-	-	*
		45.60000	12.00000	82.00000	-3.1091	2.5122	3.4633	-	-	-	*
		46.80000	12.00000	82.00000	-3.0599	2.1826	3.0180	-	-	-	*
		48.00000	12.00000	82.00000	-2.9437	1.8719	2.5662	-	-	-	*
		49.20000	12.00000	82.00000	-2.7730	1.5834	2.1307	-	-	-	*
		50.40000	12.00000	82.00000	-2.6015	1.3665	1.7187	-	-	-	*
		51.60000	12.00000	82.00000	-2.2479	1.1169	1.2975	-	-	-	*
		52.80000	12.00000	82.00000	-1.8631	0.88412	0.89920	-	-	-	*
		54.00000	12.00000	82.00000	-1.4522	0.66747	0.51870	-	-	-	*
		55.20000	12.00000	82.00000	-1.0190	0.46593	0.16775	-	-	-	*
		56.40000	12.00000	82.00000	-0.76174	0.33375	0.10848	-	-	-	*
		57.60000	12.00000	82.00000	-0.55090	0.22731	0.079375	-	-	-	*
		58.80000	12.00000	82.00000	-0.32986	0.12862	0.055095	-	-	-	*
		60.00000	12.00000	82.00000	-0.10010	0.036994	0.023011	-	-	-	*
		0.00000	12.80000	82.00000	1.7259	0.64828	0.36145	-	-	-	*
		1.20000	12.80000	82.00000	1.9288	0.76953	0.48040	-	-	-	*
		2.40000	12.80000	82.00000	2.1182	0.90112	0.70618	-	-	-	*
		3.60000	12.80000	82.00000	2.2915	1.0441	1.1460	-	-	-	*
		4.80000	12.80000	82.00000	2.4454	1.1994	1.6005	-	-	-	*
		6.00000	12.80000	82.00000	2.5760	1.3680	2.0636	-	-	-	*
		7.20000	12.80000	82.00000	2.6782	1.5506	2.5276	-	-	-	*
		8.40000	12.80000	82.00000	2.8321	1.8023	2.9832	-	-	-	*
		9.60000	12.80000	82.00000	2.9923	2.1139	3.4201	-	-	-	*
		10.80000	12.80000	82.00000	3.0907	2.4535	3.8271	-	-	-	*
		12.00000	12.80000	82.00000	3.1109	2.8181	4.1923	-	-	-	*
		13.20000	12.80000	82.00000	3.0918	3.2612	4.5543	-	-	-	*
		14.40000	12.80000	82.00000	3.0748	3.8813	4.9835	-	-	-	*
		15.60000	12.80000	82.00000	2.9074	4.5688	5.3866	-	-	-	*
		16.80000	12.80000	82.00000	2.5446	5.2955	5.7564	-	-	-	*
		18.00000	12.80000	82.00000	1.9502	6.0067	6.0850	-	-	-	*
		19.20000	12.80000	82.00000	1.1179	6.6211	6.3634	-	-	-	*
		20.40000	12.80000	82.00000	0.091530	7.0478	6.5811	-	-	-	*
		21.60000	12.80000	82.00000	0.0	9.8568	8.3304	-	-	-	*
		22.80000	12.80000	82.00000	0.0	9.8568	8.3304	-	-	-	*
		24.00000	12.80000	82.00000	0.0	9.8568	8.3304	-	-	-	*
		25.20000	12.80000	82.00000	0.0	9.8568	8.3304	-	-	-	*
		26.40000	12.80000	82.00000	0.0	9.8568	8.3304	-	-	-	*
		27.60000	12.80000	82.00000	-0.17630	9.1409	7.8791	-	-	-	*
		28.80000	12.80000	82.00000	-0.33886	9.0413	7.8539	-	-	-	*
		30.00000	12.80000	82.00000	-0.46612	8.9323	7.8383	-	-	-	*
		31.20000	12.80000	82.00000	-0.56018	8.8245	7.8289	-	-	-	*
		32.40000	12.80000	82.00000	-0.62679	8.7248	7.8219	-	-	-	*
		33.60000	12.80000	82.00000	-0.67253	8.6362	7.8134	-	-	-	*
		34.80000	12.80000	82.00000	-0.72638	8.5807	7.8246	-	-	-	*
		36.00000	12.80000	82.00000	-0.79163	8.5485	7.8478	-	-	-	*
		37.20000	12.80000	82.00000	-0.99549	6.3356	6.5140	-	-	-	*
		38.40000	12.80000	82.00000	-1.8689	5.9432	6.3131	-	-	-	*
		39.60000	12.80000	82.00000	-2.5680	5.3906	6.0217	-	-	-	*
		40.80000	12.80000	82.00000	-3.0575	4.7570	5.6535	-	-	-	*
		42.00000	12.80000	82.00000	-3.3448	4.1122	5.2228	-	-	-	*
		43.20000	12.80000	82.00000	-3.4623	3.5028	4.7446	-	-	-	*
		44.40000	12.80000	82.00000	-3.4491	2.9525	4.2344	-	-	-	*
		45.60000	12.80000	82.00000	-3.4307	2.5491	3.7681	-	-	-	*
		46.80000	12.80000	82.00000	-3.3575	2.1997	3.2936	-	-	-	*
		48.00000	12.80000	82.00000	-3.2153	1.8770	2.8095	-	-	-	*
		49.20000	12.80000	82.00000	-3.0191	1.5824	2.3400	-	-	-	*
		50.40000	12.80000	82.00000	-2.8238	1.3462	1.9067	-	-	-	*
		51.60000	12.80000	82.00000	-2.4483	1.1022	1.4592	-	-	-	*
		52.80000	12.80000	82.00000	-2.0432	0.87663	1.0389	-	-	-	*
		54.00000	12.80000	82.00000	-1.6135	0.66815	0.64098	-	-	-	*
		55.20000	12.80000	82.00000	-1.1631	0.47540	0.25591	-	-	-	*
		56.40000	12.80000	82.00000	-0.84629	0.33590	0.12072	-	-	-	*
		57.60000	12.80000	82.00000	-0.62610	0.23403	0.087404	-	-	-	*
		58.80000	12.80000	82.00000	-0.39655	0.14007	0.062166	-	-	-	*
		60.00000	12.80000	82.00000	-0.15904	0.053244	0.032497	-	-	-	*
		0.00000	13.60000	82.00000	1.8267	0.61482	0.39319	-	-	-	*
		1.20000	13.60000	82.00000	2.0411	0.72972	0.52249	-	-	-	*
		2.40000	13.60000	82.00000	2.2433	0.85517	0.83483	-	-	-	*
		3.60000	13.60000	82.00000	2.4307	0.99242	1.2921	-	-	-	*
		4.80000	13.60000	82.00000	2.6003	1.1428	1.7655	-	-	-	*
		6.00000	13.60000	82.00000	2.7481	1.3077	2.2486	-	-	-	*
		7.20000	13.60000	82.00000	2.8669	1.4874	2.7332	-	-	-	*
		8.40000	13.60000	82.00000	3.1052	1.7707	3.2097	-	-	-	*
		9.60000	13.60000	82.00000	3.2970	2.0871	3.6672	-	-	-	*
		10.80000	13.60000	82.00000	3.4284	2.4388	4.0934	-	-	-	*
		12.00000	13.60000	82.00000	3.4805	2.8253	4.4758	-	-	-	*
		13.20000	13.60000	82.00000	3.4295	3.2416	4.8012	-	-	-	*
		14.40000	13.60000	82.00000	3.3861	3.8302	5.1867	-	-	-	*
		15.60000	13.60000	82.00000	3.2490	4.5752	5.6029	-	-	-	*
		16.80000	13.60000	82.00000	2.8898	5.3891	5.9877	-	-	-	*
		18.00000	13.60000	82.00000	2.2505	6.2113	6.3342	-	-	-	*
		19.20000	13.60000	82.00000	1.3072	6.9383	6.6343	-	-	-	*
		20.40000	13.60000	82.00000	0.10788	7.4436	6.8768	-	-	-	*
		21.60000	13.60000	82.00000	0.0	10.355	8.6765	-	-	-	*
		22.80000	13.60000	82.00000	0.0	10.355	8.6765	-	-	-	*
		24.00000	13.60000	82.00000	0.0	10.355	8.6765	-	-	-	*
		25.20000	13.60000	82.00000	0.0	10.355	8.6765	-	-	-	*
		26.40000	13.60000	82.00000	0.0	10.355	8.6765	-	-	-	*
		27.60000	13.60000	82.00000	-0.19518	9.6298	8.2541	-	-	-	*
		28.80000	13.60000	82.00000	-0.37021	9.5161	8.2314	-	-	-	*
		30.00000	13.60000	82.00000	-0.50140	9.3940	8.2206	-	-	-	*
		31.20000	13.60000	82.00000	-0.59343	9.2767	8.2175	-	-	-	*
		32.40000	13.60000	82.00000	-0.65502	9.1715	8.2175	-	-	-	*
		33.60000	13.60000	82.00000	-0.70353	9.0892	8.2255	-	-	-	*
		34.80000	13.60000	82.00000	-0.77957	9.0536	8.2698	-	-	-	*
		36.00000	13.60000	82.00000	-0.84257	9.0175	8.2998	-	-	-	*
		37.20000	13.60000	82.00000	-1.0722	6.6961	6.8907	-	-	-	*
		38.40000	13.60000	82.00000	-2.0922	6.2310	6.6696	-	-	-	*
		39.60000	13.60000	82.00000	-2.8833	5.5780	6.3575	-	-	-	*
		40.80000	13.60000	82.00000	-3.4078	4.8468	5.9687	-	-	-	*
		42.00000	13.60000	82.00000	-3.6888	4.1257	5.5176	-	-	-	*
		43.20000	13.60000	82.00000	-3.7774	3.4659	5.0185	-	-	-	*
		44.40000	13.60000	82.00000	-3.7886	2.9451	4.5335	-	-	-	*
		45.60000	13.60000	82.00000	-3.7744	2.5471	4.0670	-	-	-	*
		46.80000	13.60000	82.00000	-3.6697	2.1810	3.5633	-	-	-	*
		48.00000	13.60000	82.00000	-3.4959	1.8500	3.0475	-	-	-	*
		49.20000	13.60000	82.00000	-3.2697	1.5534	2.5447	-	-	-	*
		50.40000	13.60000	82.00000	-3.0182	1.2960	2.0798	-	-	-	*
		51.60000	13.60000	82.00000	-2.6464	1.0683	1.6150	-	-	-	*
		52.80000	13.60000	82.00000	-2.2197	0.85242	1.1723	-	-	-	*
		54.00000	13.60000	82.00000	-1.7704	0.65435	0.75664	-	-	-	*
		55.20000	13.60000	82.00000	-1.3023	0.47236	0.35864	-	-	-	*
		56.40000	13.60000	82.00000	-0.92859	0.33027	0.13360	-	-	-	*
		57.60000	13.60000	82.00000	-0.69880	0.23406	0.095547	-	-	-	*
		58.80000	13.60000	82.00000	-0.46057	0.14578	0.068631	-	-	-	*
		60.00000	13.60000	82.00000	-0.21522	0.064567	0.040427	-	-	-	*
		0.00000	14.40000	82.00000	1.9237	0.57242	0.42442	-	-	-	*
		1.20000	14.40000	82.00000	2.1499	0.67950	0.56379	-	-	-	*
		2.40000	14.40000	82.00000	2.3652	0.79712	0.95517	-	-	-	*
		3.60000	14.40000	82.00000	2.5674	0.92670	1.4293	-	-	-	*
		4.80000	14.40000	82.00000	2.7535	1.0698	1.9210	-	-	-	*
		6.00000	14.40000	82.00000	2.9198	1.2283	2.4236	-	-	-	*
		7.20000	14.40000	82.00000	3.1110	1.4269	2.9286	-	-	-	*
		8.40000	14.40000	82.00000	3.3818	1.7049	3.4259	-	-	-	*
		9.60000	14.40000	82.00000	3.6103	2.0204	3.9038	-	-	-	*
		10.80000	14.40000	82.00000	3.7817	2.3782	4.3496	-	-	-	*
		12.00000	14.40000	82.00000	3.8754	2.7812	4.7495	-	-	-	*
		13.20000	14.40000	82.00000	3.8636	3.2285	5.0892	-	-	-	*
		14.40000	14.40000	82.00000	3.7102	3.7102	5.3551	-	-	-	*
		15.60000	14.40000	82.00000	3.6211	4.5079	5.7808	-	-	-	*
		16.80000	14.40000	82.00000	3.2844	5.4149	6.1775	-	-	-	*
		18.00000	14.40000	82.00000	2.6103	6.3692	6.5399	-	-	-	*
		19.20000	14.40000	82.00000	1.5431	7.2407	6.8615	-	-	-	*
		20.40000	14.40000	82.00000	0.12868	7.8493	7.1316	-	-	-	*
		21.60000	14.40000	82.00000	0.0	10.865	8.9621	-	-	-	*
		22.80000	14.40000	82.00000	0.0	10.865	8.9621	-	-	-	*
		24.00000	14.40000	82.00000	0.0	10.865	8.9621	-	-	-	*
		25.20000	14.40000	82.00000	0.0	10.865	8.9621	-	-	-	*
		26.40000	14.40000	82.00000	0.0	10.865	8.9621	-	-	-	*
		27.60000	14.40000	82.00000	-0.21849	10.127	8.5713	-	-	-	*

Type/No.		Coordinates			Displacements			Angle of Line	
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line
		28.80000	14.40000	82.00000	-0.40725	9.9953	8.5513	-	-
		30.00000	14.40000	82.00000	-0.54079	9.8577	8.5456	-	-
		31.20000	14.40000	82.00000	-0.62829	9.7307	8.5491	-	-
		32.40000	14.40000	82.00000	-0.68273	9.6211	8.5565	-	-
		33.60000	14.40000	82.00000	-0.76375	9.5714	8.6092	-	-
		34.80000	14.40000	82.00000	-0.83720	9.5305	8.6609	-	-
		36.00000	14.40000	82.00000	-0.89665	9.4910	8.6976	-	-
		37.20000	14.40000	82.00000	-1.1588	7.0596	7.2296	-	-
		38.40000	14.40000	82.00000	-2.3606	6.4997	6.9858	-	-
		39.60000	14.40000	82.00000	-3.2533	5.7190	6.6528	-	-
		40.80000	14.40000	82.00000	-3.8029	4.8727	6.2453	-	-
		42.00000	14.40000	82.00000	-4.0607	4.0710	5.7767	-	-
		43.20000	14.40000	82.00000	-4.1203	3.3806	5.2732	-	-
		44.40000	14.40000	82.00000	-4.1913	2.9204	4.8481	-	-
		45.60000	14.40000	82.00000	-4.1382	2.4984	4.3565	-	-
		46.80000	14.40000	82.00000	-3.9936	2.1210	3.8240	-	-
		48.00000	14.40000	82.00000	-3.7821	1.7874	3.2770	-	-
		49.20000	14.40000	82.00000	-3.5219	1.4939	2.7420	-	-
		50.40000	14.40000	82.00000	-3.2256	1.2356	2.2446	-	-
		51.60000	14.40000	82.00000	-2.8401	1.0145	1.7629	-	-
		52.80000	14.40000	82.00000	-2.3910	0.81119	1.2981	-	-
		54.00000	14.40000	82.00000	-1.9215	0.62601	0.86474	-	-
		55.20000	14.40000	82.00000	-1.4352	0.45690	0.45358	-	-
		56.40000	14.40000	82.00000	-1.0078	0.31687	0.14687	-	-
		57.60000	14.40000	82.00000	-0.76822	0.22748	0.10376	-	-
		58.80000	14.40000	82.00000	-0.52127	0.14586	0.074643	-	-
		60.00000	14.40000	82.00000	-0.26809	0.071103	0.047134	-	-
		0.00000	15.20000	82.00000	2.0161	0.52124	0.45455	-	-
		1.20000	15.20000	82.00000	2.2541	0.61900	0.60357	-	-
		2.40000	15.20000	82.00000	2.4827	0.72699	1.0660	-	-
		3.60000	15.20000	82.00000	2.7000	0.84675	1.5562	-	-
		4.80000	15.20000	82.00000	2.9033	0.98009	2.0655	-	-
		6.00000	15.20000	82.00000	3.0891	1.1291	2.5869	-	-
		7.20000	15.20000	82.00000	3.3517	1.3356	3.1117	-	-
		8.40000	15.20000	82.00000	3.6578	1.6022	3.6294	-	-
		9.60000	15.20000	82.00000	3.9273	1.9096	4.1278	-	-
		10.80000	15.20000	82.00000	4.1457	2.2652	4.5933	-	-
		12.00000	15.20000	82.00000	4.2914	2.6758	5.0111	-	-
		13.20000	15.20000	82.00000	4.3335	3.1462	5.3658	-	-
		14.40000	15.20000	82.00000	4.2284	3.6739	5.6419	-	-
		15.60000	15.20000	82.00000	4.0188	4.3469	5.9159	-	-
		16.80000	15.20000	82.00000	3.7325	5.3465	6.3200	-	-
		18.00000	15.20000	82.00000	3.0450	6.4554	6.6950	-	-
		19.20000	15.20000	82.00000	1.8434	7.5155	7.0375	-	-
		20.40000	15.20000	82.00000	0.15595	8.2652	7.3385	-	-
		21.60000	15.20000	82.00000	0.0	11.387	9.1768	-	-
		22.80000	15.20000	82.00000	0.0	11.387	9.1768	-	-
		24.00000	15.20000	82.00000	0.0	11.387	9.1768	-	-
		25.20000	15.20000	82.00000	0.0	11.387	9.1768	-	-
		26.40000	15.20000	82.00000	0.0	11.387	9.1768	-	-
		27.60000	15.20000	82.00000	-0.24795	10.631	8.8191	-	-
		28.80000	15.20000	82.00000	-0.45131	10.477	8.8019	-	-
		30.00000	15.20000	82.00000	-0.58421	10.321	8.8015	-	-
		31.20000	15.20000	82.00000	-0.66368	10.185	8.8116	-	-
		32.40000	15.20000	82.00000	-0.74213	10.103	8.8562	-	-
		33.60000	15.20000	82.00000	-0.83008	10.056	8.9261	-	-
		34.80000	15.20000	82.00000	-0.89899	10.011	8.9849	-	-
		36.00000	15.20000	82.00000	-0.95338	9.9686	9.0282	-	-
		37.20000	15.20000	82.00000	-1.2584	7.4253	7.5219	-	-
		38.40000	15.20000	82.00000	-2.6901	6.7369	7.2522	-	-
		39.60000	15.20000	82.00000	-3.6910	5.7908	6.8989	-	-
		40.80000	15.20000	82.00000	-4.2460	4.8113	6.4760	-	-
		42.00000	15.20000	82.00000	-4.4561	3.9302	5.9942	-	-
		43.20000	15.20000	82.00000	-4.5996	3.3291	5.5949	-	-
		44.40000	15.20000	82.00000	-4.6222	2.8332	5.1501	-	-
		45.60000	15.20000	82.00000	-4.5178	2.3950	4.6334	-	-
		46.80000	15.20000	82.00000	-4.3246	2.0144	4.0723	-	-
		48.00000	15.20000	82.00000	-4.0698	1.6857	3.4949	-	-
		49.20000	15.20000	82.00000	-3.7719	1.4019	2.9288	-	-
		50.40000	15.20000	82.00000	-3.4433	1.1559	2.4007	-	-
		51.60000	15.20000	82.00000	-3.0270	0.94052	1.9011	-	-
		52.80000	15.20000	82.00000	-2.5548	0.75293	1.4149	-	-
		54.00000	15.20000	82.00000	-2.0649	0.58328	0.96420	-	-
		55.20000	15.20000	82.00000	-1.5604	0.42928	0.54004	-	-
		56.40000	15.20000	82.00000	-1.0829	0.29583	0.16020	-	-
		57.60000	15.20000	82.00000	-0.83357	0.21446	0.11192	-	-
		58.80000	15.20000	82.00000	-0.57796	0.14051	0.080268	-	-
		60.00000	15.20000	82.00000	-0.31706	0.073062	0.052859	-	-
		0.00000	16.00000	82.00000	2.1029	0.46160	0.48301	-	-
		1.20000	16.00000	82.00000	2.3524	0.54849	0.68672	-	-
		2.40000	16.00000	82.00000	2.5943	0.64499	1.1663	-	-
		3.60000	16.00000	82.00000	2.8267	0.75267	1.6716	-	-
		4.80000	16.00000	82.00000	3.0474	0.87345	2.1975	-	-
		6.00000	16.00000	82.00000	3.2533	1.0097	2.7369	-	-
		7.20000	16.00000	82.00000	3.5847	1.2129	3.2808	-	-
		8.40000	16.00000	82.00000	3.9281	1.4608	3.8183	-	-
		9.60000	16.00000	82.00000	4.2420	1.7513	4.3369	-	-
		10.80000	16.00000	82.00000	4.5133	2.0938	4.8222	-	-
		12.00000	16.00000	82.00000	4.7209	2.4993	5.2585	-	-
		13.20000	16.00000	82.00000	4.8328	2.9791	5.6291	-	-
		14.40000	16.00000	82.00000	4.7999	3.5409	5.9165	-	-
		15.60000	16.00000	82.00000	4.5503	4.1788	6.1043	-	-
		16.80000	16.00000	82.00000	4.2329	5.1481	6.4097	-	-
		18.00000	16.00000	82.00000	3.5723	6.4302	6.7919	-	-
		19.20000	16.00000	82.00000	2.2360	7.7401	7.1535	-	-
		20.40000	16.00000	82.00000	0.19314	8.6912	7.4898	-	-
		21.60000	16.00000	82.00000	0.0	11.921	9.3095	-	-
		22.80000	16.00000	82.00000	0.0	11.921	9.3095	-	-
		24.00000	16.00000	82.00000	0.0	11.921	9.3095	-	-
		25.20000	16.00000	82.00000	0.0	11.921	9.3095	-	-
		26.40000	16.00000	82.00000	0.0	11.921	9.3095	-	-
		27.60000	16.00000	82.00000	-0.28620	11.141	8.9848	-	-
		28.80000	16.00000	82.00000	-0.50384	10.956	8.9703	-	-
		30.00000	16.00000	82.00000	-0.63082	10.782	8.9751	-	-
		31.20000	16.00000	82.00000	-0.71088	10.651	9.0026	-	-
		32.40000	16.00000	82.00000	-0.82015	10.596	9.0855	-	-
		33.60000	16.00000	82.00000	-0.90213	10.542	9.1625	-	-
		34.80000	16.00000	82.00000	-0.96421	10.493	9.2281	-	-
		36.00000	16.00000	82.00000	-1.0120	10.450	9.2774	-	-
		37.20000	16.00000	82.00000	-1.3761	7.7915	7.7580	-	-
		38.40000	16.00000	82.00000	-3.1054	6.9204	7.4585	-	-
		39.60000	16.00000	82.00000	-4.2112	5.7578	7.0870	-	-
		40.80000	16.00000	82.00000	-4.7355	4.6309	6.6535	-	-
		42.00000	16.00000	82.00000	-4.9805	3.7873	6.2617	-	-
		43.20000	16.00000	82.00000	-5.1211	3.1902	5.9015	-	-
		44.40000	16.00000	82.00000	-5.0752	2.6702	5.4362	-	-
		45.60000	16.00000	82.00000	-4.9060	2.2286	4.8941	-	-
		46.80000	16.00000	82.00000	-4.6562	1.8565	4.3049	-	-
		48.00000	16.00000	82.00000	-4.3533	1.5424	3.6980	-	-
		49.20000	16.00000	82.00000	-4.0151	1.2762	3.1023	-	-
		50.40000	16.00000	82.00000	-3.6529	1.0487	2.5452	-	-
		51.60000	16.00000	82.00000	-3.2046	0.84643	2.0277	-	-
		52.80000	16.00000	82.00000	-2.7091	0.67794	1.5211	-	-
		54.00000	16.00000	82.00000	-2.1988	0.52660	1.0539	-	-
		55.20000	16.00000	82.00000	-1.6764	0.38999	0.61724	-	-
		56.40000	16.00000	82.00000	-1.1529	0.26743	0.19443	-	-
		57.60000	16.00000	82.00000	-0.89404	0.19530	0.11985	-	-
		58.80000	16.00000	82.00000	-0.62996	0.13004	0.085506	-	-
		60.00000	16.00000	82.00000	-0.36155	0.070739	0.057765	-	-
		0.00000	16.80000	82.00000	2.1828	0.39398	0.50923	-	-
		1.20000	16.80000	82.00000	2.4436	0.46847	0.76291	-	-
		2.40000	16.80000	82.00000	2.6984	0.55160	1.2548	-	-
		3.60000	16.80000	82.00000	2.9456	0.64490	1.7741	-	-
		4.80000	16.80000	82.00000	3.1835	0.75026	2.3154	-	-
		6.00000	16.80000	82.00000	3.4104	0.87023	2.8717	-	-
		7.20000	16.80000	82.00000	3.8055	1.0587	3.4337	-	-
		8.40000	16.80000	82.00000	4.1866	1.2802	3.9904	-	-
		9.60000	16.80000	82.00000	4.5469	1.5435	4.5288	-	-
		10.80000	16.80000	82.00000	4.8752	1.8596	5.0339	-	-
		12.00000	16.80000	82.00000	5.1528	2.2430	5.4893	-	-
		13.20000	16.80000	82.00000	5.3494	2.7114	5.8769	-	-

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		14.40000	16.80000	82.00000	5.4149	3.2844	6.1775	-	-	- *
		15.60000	16.80000	82.00000	5.2662	3.9765	6.3718	-	-	- *
		16.80000	16.80000	82.00000	4.7728	4.7728	6.4416	-	-	- *
		18.00000	16.80000	82.00000	4.2091	6.2294	6.8231	-	-	- *
		19.20000	16.80000	82.00000	2.7653	7.8705	7.1998	-	-	- *
		20.40000	16.80000	82.00000	0.24665	9.1262	7.5774	-	-	- *
		21.60000	16.80000	82.00000	0.0	12.468	9.3486	-	-	- *
		22.80000	16.80000	82.00000	0.0	12.468	9.3486	-	-	- *
		24.00000	16.80000	82.00000	0.0	12.468	9.3486	-	-	- *
		25.20000	16.80000	82.00000	0.0	12.468	9.3486	-	-	- *
		26.40000	16.80000	82.00000	0.0	12.468	9.3486	-	-	- *
		27.60000	16.80000	82.00000	-0.33756	11.653	9.0548	-	-	- *
		28.80000	16.80000	82.00000	-0.56582	11.428	9.0426	-	-	- *
		30.00000	16.80000	82.00000	-0.67807	11.235	9.0526	-	-	- *
		31.20000	16.80000	82.00000	-0.80539	11.152	9.1307	-	-	- *
		32.40000	16.80000	82.00000	-0.90657	11.086	9.2203	-	-	- *
		33.60000	16.80000	82.00000	-0.97880	11.028	9.3039	-	-	- *
		34.80000	16.80000	82.00000	-1.0316	10.978	9.3755	-	-	- *
		36.00000	16.80000	82.00000	-1.0714	10.935	9.4302	-	-	- *
		37.20000	16.80000	82.00000	-1.5222	8.1552	7.9272	-	-	- *
		38.40000	16.80000	82.00000	-3.6455	7.0086	7.5933	-	-	- *
		39.60000	16.80000	82.00000	-4.8271	5.5627	7.2078	-	-	- *
		40.80000	16.80000	82.00000	-5.2900	4.3205	6.7977	-	-	- *
		42.00000	16.80000	82.00000	-5.6301	3.5775	6.5645	-	-	- *
		43.20000	16.80000	82.00000	-5.6750	2.9418	6.1898	-	-	- *
		44.40000	16.80000	82.00000	-5.5389	2.4189	5.7028	-	-	- *
		45.60000	16.80000	82.00000	-5.2930	1.9926	5.1351	-	-	- *
		46.80000	16.80000	82.00000	-4.9802	1.6439	4.5182	-	-	- *
		48.00000	16.80000	82.00000	-4.6261	1.3562	3.8832	-	-	- *
		49.20000	16.80000	82.00000	-4.2464	1.1164	3.2597	-	-	- *
		50.40000	16.80000	82.00000	-3.8503	0.91429	2.6757	-	-	- *
		51.60000	16.80000	82.00000	-3.3699	0.73280	2.1407	-	-	- *
		52.80000	16.80000	82.00000	-2.8515	0.58690	1.6152	-	-	- *
		54.00000	16.80000	82.00000	-2.3213	0.45668	1.1327	-	-	- *
		55.20000	16.80000	82.00000	-1.7816	0.33977	0.68442	-	-	- *
		56.40000	16.80000	82.00000	-1.2341	0.23422	0.25581	-	-	- *
		57.60000	16.80000	82.00000	-0.94878	0.17041	0.12733	-	-	- *
		58.80000	16.80000	82.00000	-0.67658	0.11483	0.090310	-	-	- *
		60.00000	16.80000	82.00000	-0.40098	0.064506	0.061954	-	-	- *
		0.00000	17.60000	82.00000	2.2551	0.31901	0.53268	-	-	- *
		1.20000	17.60000	82.00000	2.5265	0.37963	0.82766	-	-	- *
		2.40000	17.60000	82.00000	2.7934	0.44757	1.3306	-	-	- *
		3.60000	17.60000	82.00000	3.0549	0.52421	1.8624	-	-	- *
		4.80000	17.60000	82.00000	3.3094	0.61129	2.4179	-	-	- *
		6.00000	17.60000	82.00000	3.5839	0.71679	2.9897	-	-	- *
		7.20000	17.60000	82.00000	4.0089	0.87412	3.5687	-	-	- *
		8.40000	17.60000	82.00000	4.4269	1.0610	4.1436	-	-	- *
		9.60000	17.60000	82.00000	4.8333	1.2859	4.7011	-	-	- *
		10.80000	17.60000	82.00000	5.2198	1.5606	5.2259	-	-	- *
		12.00000	17.60000	82.00000	5.5720	1.9010	5.7009	-	-	- *
		13.20000	17.60000	82.00000	5.8646	2.3298	6.1070	-	-	- *
		14.40000	17.60000	82.00000	6.0524	2.8774	6.4233	-	-	- *
		15.60000	17.60000	82.00000	6.0523	3.5820	6.6276	-	-	- *
		16.80000	17.60000	82.00000	5.7092	4.4748	6.6972	-	-	- *
		18.00000	17.60000	82.00000	4.9574	5.7506	6.7809	-	-	- *
		19.20000	17.60000	82.00000	3.5031	7.8146	7.1644	-	-	- *
		20.40000	17.60000	82.00000	0.32991	9.5673	7.5923	-	-	- *
		21.60000	17.60000	82.00000	0.0	13.029	9.2819	-	-	- *
		22.80000	17.60000	82.00000	0.0	13.029	9.2819	-	-	- *
		24.00000	17.60000	82.00000	0.0	13.029	9.2819	-	-	- *
		25.20000	17.60000	82.00000	0.0	13.029	9.2819	-	-	- *
		26.40000	17.60000	82.00000	0.0	13.029	9.2819	-	-	- *
		27.60000	17.60000	82.00000	-0.40909	12.157	9.0142	-	-	- *
		28.80000	17.60000	82.00000	-0.63599	11.881	9.0034	-	-	- *
		30.00000	17.60000	82.00000	-0.78115	11.726	9.0543	-	-	- *
		31.20000	17.60000	82.00000	-0.91330	11.642	9.1497	-	-	- *
		32.40000	17.60000	82.00000	-0.99947	11.570	9.2452	-	-	- *
		33.60000	17.60000	82.00000	-1.0580	11.511	9.3345	-	-	- *
		34.80000	17.60000	82.00000	-1.0994	11.463	9.4113	-	-	- *
		36.00000	17.60000	82.00000	-1.1300	11.424	9.4704	-	-	- *
		37.20000	17.60000	82.00000	-1.7185	8.5095	8.0175	-	-	- *
		38.40000	17.60000	82.00000	-4.3720	6.9154	7.6432	-	-	- *
		39.60000	17.60000	82.00000	-5.5378	5.1166	7.2526	-	-	- *
		40.80000	17.60000	82.00000	-6.1344	4.0104	7.0885	-	-	- *
		42.00000	17.60000	82.00000	-6.3318	3.1980	6.8486	-	-	- *
		43.20000	17.60000	82.00000	-6.2420	2.5621	6.4565	-	-	- *
		44.40000	17.60000	82.00000	-5.9965	2.0689	5.9464	-	-	- *
		45.60000	17.60000	82.00000	-5.6654	1.6826	5.3526	-	-	- *
		46.80000	17.60000	82.00000	-5.2864	1.3754	4.7089	-	-	- *
		48.00000	17.60000	82.00000	-4.8806	1.1272	4.0472	-	-	- *
		49.20000	17.60000	82.00000	-4.4599	0.92351	3.3979	-	-	- *
		50.40000	17.60000	82.00000	-4.0311	0.75389	2.7898	-	-	- *
		51.60000	17.60000	82.00000	-3.5335	0.60335	2.2383	-	-	- *
		52.80000	17.60000	82.00000	-2.9798	0.48090	1.6958	-	-	- *
		54.00000	17.60000	82.00000	-2.4306	0.37459	1.1996	-	-	- *
		55.20000	17.60000	82.00000	-1.8745	0.27959	0.74078	-	-	- *
		56.40000	17.60000	82.00000	-1.3125	0.19417	0.30482	-	-	- *
		57.60000	17.60000	82.00000	-0.99699	0.14035	0.13414	-	-	- *
		58.80000	17.60000	82.00000	-0.71714	0.095400	0.094602	-	-	- *
		60.00000	17.60000	82.00000	-0.43480	0.054822	0.065480	-	-	- *
		0.00000	18.40000	82.00000	2.3186	0.23751	0.55284	-	-	- *
		1.20000	18.40000	82.00000	2.5998	0.28288	0.88019	-	-	- *
		2.40000	18.40000	82.00000	2.8780	0.33391	1.3927	-	-	- *
		3.60000	18.40000	82.00000	3.1526	0.39174	1.9355	-	-	- *
		4.80000	18.40000	82.00000	3.4225	0.45779	2.5034	-	-	- *
		6.00000	18.40000	82.00000	3.7376	0.54130	3.0893	-	-	- *
		7.20000	18.40000	82.00000	4.1899	0.66156	3.6838	-	-	- *
		8.40000	18.40000	82.00000	4.6420	0.80564	4.2757	-	-	- *
		9.60000	18.40000	82.00000	5.0916	0.98096	4.8514	-	-	- *
		10.80000	18.40000	82.00000	5.5340	1.1981	5.3957	-	-	- *
		12.00000	18.40000	82.00000	5.9600	1.4725	5.8908	-	-	- *
		13.20000	18.40000	82.00000	6.3522	1.8274	6.3169	-	-	- *
		14.40000	18.40000	82.00000	6.6773	2.2987	6.6521	-	-	- *
		15.60000	18.40000	82.00000	6.8673	2.9431	6.8718	-	-	- *
		16.80000	18.40000	82.00000	6.7742	3.8448	6.9486	-	-	- *
		18.00000	18.40000	82.00000	6.0570	5.0879	6.8516	-	-	- *
		19.20000	18.40000	82.00000	4.5567	7.3609	7.0310	-	-	- *
		20.40000	18.40000	82.00000	0.47646	10.006	7.5240	-	-	- *
		21.60000	18.40000	82.00000	0.0	13.604	9.0963	-	-	- *
		22.80000	18.40000	82.00000	0.0	13.604	9.0963	-	-	- *
		24.00000	18.40000	82.00000	0.0	13.604	9.0963	-	-	- *
		25.20000	18.40000	82.00000	0.0	13.604	9.0963	-	-	- *
		26.40000	18.40000	82.00000	0.0	13.604	9.0963	-	-	- *
		27.60000	18.40000	82.00000	-0.51173	12.631	8.8459	-	-	- *
		28.80000	18.40000	82.00000	-0.73418	12.325	8.8499	-	-	- *
		30.00000	18.40000	82.00000	-0.92472	12.209	8.9440	-	-	- *
		31.20000	18.40000	82.00000	-1.0309	12.115	9.0438	-	-	- *
		32.40000	18.40000	82.00000	-1.0949	12.044	9.1439	-	-	- *
		33.60000	18.40000	82.00000	-1.1365	11.991	9.2376	-	-	- *
		34.80000	18.40000	82.00000	-1.1652	11.949	9.3183	-	-	- *
		36.00000	18.40000	82.00000	-1.1860	11.917	9.3808	-	-	- *
		37.20000	18.40000	82.00000	-2.0208	8.8353	8.0145	-	-	- *
		38.40000	18.40000	82.00000	-5.3706	6.4491	7.5922	-	-	- *
		39.60000	18.40000	82.00000	-6.5857	4.5269	7.4177	-	-	- *
		40.80000	18.40000	82.00000	-7.0738	3.4094	7.3649	-	-	- *
		42.00000	18.40000	82.00000	-7.0479	2.6078	7.1117	-	-	- *
		43.20000	18.40000	82.00000	-6.7911	2.0353	6.6981	-	-	- *
		44.40000	18.40000	82.00000	-6.4255	1.6156	6.1629	-	-	- *
		45.60000	18.40000	82.00000	-6.0072	1.2987	5.5430	-	-	- *
		46.80000	18.40000	82.00000	-5.5635	1.0529	4.8734	-	-	- *
		48.00000	18.40000	82.00000	-5.1086	0.85787	4.1869	-	-	- *
		49.20000	18.40000	82.00000	-4.6499	0.69990	3.5145	-	-	- *
		50.40000	18.40000	82.00000	-4.1909	0.56971	2.8851	-	-	- *
		51.60000	18.40000	82.00000	-3.6875	0.45692	2.3188	-	-	- *
		52.80000	18.40000	82.00000	-3.0916	0.36150	1.7614	-	-	- *
		54.00000	18.40000	82.00000	-2.5249	0.28170	1.2534	-	-	- *
		55.20000	18.40000	82.00000	-1.9535	0.21070	0.78561	-	-	- *
		56.40000	18.40000	82.00000	-1.3782	0.14708	0.34327	-	-	- *
		57.60000	18.40000	82.00000	-1.0379	0.10580	0.14002	-	-	- *
		58.80000	18.40000	82.00000	-0.75101	0.072345	0.098286	-	-	- *
		60.00000	18.40000	82.00000	-0.46246	0.042225	0.068365	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line			
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis	
		0.00000	19.20000	82.00000	2.3724	0.15044	0.56929	-	-	-	*
		1.20000	19.20000	82.00000	2.6623	0.17933	0.91980	-	-	-	*
		2.40000	19.20000	82.00000	2.9507	0.21193	1.4402	-	-	-	*
		3.60000	19.20000	82.00000	3.2370	0.24900	1.9923	-	-	-	*
		4.80000	19.20000	82.00000	3.5207	0.29152	2.5709	-	-	-	*
		6.00000	19.20000	82.00000	3.8676	0.34675	3.1690	-	-	-	*
		7.20000	19.20000	82.00000	4.3436	0.42456	3.7774	-	-	-	*
		8.40000	19.20000	82.00000	4.8252	0.51841	4.3847	-	-	-	*
		9.60000	19.20000	82.00000	5.3125	0.63360	4.9776	-	-	-	*
		10.80000	19.20000	82.00000	5.8041	0.77787	5.5406	-	-	-	*
		12.00000	19.20000	82.00000	6.2964	0.96297	6.0560	-	-	-	*
		13.20000	19.20000	82.00000	6.7811	1.2076	6.5038	-	-	-	*
		14.40000	19.20000	82.00000	7.2407	1.5431	6.8615	-	-	-	*
		15.60000	19.20000	82.00000	7.6362	2.0259	7.1036	-	-	-	*
		16.80000	19.20000	82.00000	7.8705	2.7653	7.1998	-	-	-	*
		18.00000	19.20000	82.00000	7.6593	3.9828	7.1113	-	-	-	*
		19.20000	19.20000	82.00000	5.9949	5.9949	6.7740	-	-	-	*
		20.40000	19.20000	82.00000	0.80044	10.406	7.3571	-	-	-	*
		21.60000	19.20000	82.00000	0.0	14.195	8.7786	-	-	-	*
		22.80000	19.20000	82.00000	0.0	14.195	8.7786	-	-	-	*
		24.00000	19.20000	82.00000	0.0	14.195	8.7786	-	-	-	*
		25.20000	19.20000	82.00000	0.0	14.195	8.7786	-	-	-	*
		26.40000	19.20000	82.00000	0.0	14.195	8.7786	-	-	-	*
		27.60000	19.20000	82.00000	-0.65246	13.016	8.5283	-	-	-	*
		28.80000	19.20000	82.00000	-0.94836	12.781	8.5986	-	-	-	*
		30.00000	19.20000	82.00000	-1.0840	12.648	8.6939	-	-	-	*
		31.20000	19.20000	82.00000	-1.1494	12.563	8.7959	-	-	-	*
		32.40000	19.20000	82.00000	-1.1865	12.507	8.8988	-	-	-	*
		33.60000	19.20000	82.00000	-1.2099	12.467	8.9952	-	-	-	*
		34.80000	19.20000	82.00000	-1.2260	12.437	9.0784	-	-	-	*
		36.00000	19.20000	82.00000	-1.2376	12.415	9.1427	-	-	-	*
		37.20000	19.20000	82.00000	-2.6162	9.0561	7.8960	-	-	-	*
		38.40000	19.20000	82.00000	-6.7733	5.2628	7.4823	-	-	-	*
		39.60000	19.20000	82.00000	-7.9743	3.4828	7.6925	-	-	-	*
		40.80000	19.20000	82.00000	-8.0203	2.4265	7.6277	-	-	-	*
		42.00000	19.20000	82.00000	-7.7136	1.7824	7.3511	-	-	-	*
		43.20000	19.20000	82.00000	-7.2806	1.3592	6.9107	-	-	-	*
		44.40000	19.20000	82.00000	-6.7993	1.0633	6.3484	-	-	-	*
		45.60000	19.20000	82.00000	-6.3011	0.84656	5.7025	-	-	-	*
		46.80000	19.20000	82.00000	-5.8000	0.68177	5.0084	-	-	-	*
		48.00000	19.20000	82.00000	-5.3022	0.55283	4.2996	-	-	-	*
		49.20000	19.20000	82.00000	-4.8105	0.44950	3.6070	-	-	-	*
		50.40000	19.20000	82.00000	-4.3256	0.36502	2.9596	-	-	-	*
		51.60000	19.20000	82.00000	-3.8142	0.29306	2.3806	-	-	-	*
		52.80000	19.20000	82.00000	-3.1847	0.23066	1.8110	-	-	-	*
		54.00000	19.20000	82.00000	-2.6023	0.17974	1.2933	-	-	-	*
		55.20000	19.20000	82.00000	-2.0173	0.13458	0.81828	-	-	-	*
		56.40000	19.20000	82.00000	-1.4301	0.094248	0.37074	-	-	-	*
		57.60000	19.20000	82.00000	-1.0708	0.067573	0.14480	-	-	-	*
		58.80000	19.20000	82.00000	-0.77760	0.046371	0.10127	-	-	-	*
		60.00000	19.20000	82.00000	-0.48351	0.027329	0.070607	-	-	-	*
		0.00000	20.00000	82.00000	2.4157	0.058919	0.58164	-	-	-	*
		1.20000	20.00000	82.00000	2.7132	0.070290	0.94592	-	-	-	*
		2.40000	20.00000	82.00000	3.0101	0.083153	1.4725	-	-	-	*
		3.60000	20.00000	82.00000	3.3064	0.097823	2.0319	-	-	-	*
		4.80000	20.00000	82.00000	3.6018	0.11471	2.6193	-	-	-	*
		6.00000	20.00000	82.00000	3.9710	0.13693	3.2276	-	-	-	*
		7.20000	20.00000	82.00000	4.4657	0.16788	3.8478	-	-	-	*
		8.40000	20.00000	82.00000	4.9705	0.20539	4.4688	-	-	-	*
		9.60000	20.00000	82.00000	5.4873	0.25171	5.0773	-	-	-	*
		10.80000	20.00000	82.00000	6.0173	0.31017	5.6581	-	-	-	*
		12.00000	20.00000	82.00000	6.5613	0.38596	6.1937	-	-	-	*
		13.20000	20.00000	82.00000	7.1187	0.48758	6.6644	-	-	-	*
		14.40000	20.00000	82.00000	7.6866	0.63005	7.0482	-	-	-	*
		15.60000	20.00000	82.00000	8.2559	0.84244	7.3204	-	-	-	*
		16.80000	20.00000	82.00000	8.8007	1.1893	7.4522	-	-	-	*
		18.00000	20.00000	82.00000	9.2315	1.8463	7.4070	-	-	-	*
		19.20000	20.00000	82.00000	9.0558	3.4830	7.1148	-	-	-	*
		20.40000	20.00000	82.00000	2.0876	10.438	7.0358	-	-	-	*
		21.60000	20.00000	82.00000	0.0	14.802	8.3146	-	-	-	*
		22.80000	20.00000	82.00000	0.0	14.802	8.3146	-	-	-	*
		24.00000	20.00000	82.00000	0.0	14.802	8.3146	-	-	-	*
		25.20000	20.00000	82.00000	0.0	14.802	8.3146	-	-	-	*
		26.40000	20.00000	82.00000	0.0	14.802	8.3146	-	-	-	*
		27.60000	20.00000	82.00000	-1.0255	13.318	8.1149	-	-	-	*
		28.80000	20.00000	82.00000	-1.1884	13.111	8.1951	-	-	-	*
		30.00000	20.00000	82.00000	-1.2341	13.029	8.2862	-	-	-	*
		31.20000	20.00000	82.00000	-1.2547	12.986	8.3876	-	-	-	*
		32.40000	20.00000	82.00000	-1.2663	12.960	8.4910	-	-	-	*
		33.60000	20.00000	82.00000	-1.2737	16.607	13.463	-	-	-	*
		34.80000	20.00000	82.00000	-1.2788	12.929	8.6719	-	-	-	*
		36.00000	20.00000	82.00000	-1.2825	12.920	8.7364	-	-	-	*
		37.20000	20.00000	82.00000	-4.6428	8.4535	7.5815	-	-	-	*
		38.40000	20.00000	82.00000	-9.3316	2.9269	7.8094	-	-	-	*
		39.60000	20.00000	82.00000	-9.2908	1.5879	7.9813	-	-	-	*
		40.80000	20.00000	82.00000	-8.8080	1.0342	7.8755	-	-	-	*
		42.00000	20.00000	82.00000	-8.2429	0.73675	7.5624	-	-	-	*
		43.20000	20.00000	82.00000	-7.6639	0.55248	7.0897	-	-	-	*
		44.40000	20.00000	82.00000	-7.0909	0.42782	6.4987	-	-	-	*
		45.60000	20.00000	82.00000	-6.5306	0.33830	5.8273	-	-	-	*
		46.80000	20.00000	82.00000	-5.9850	0.27116	5.1109	-	-	-	*
		48.00000	20.00000	82.00000	-5.4541	0.21914	4.3826	-	-	-	*
		49.20000	20.00000	82.00000	-4.9368	0.17774	3.6732	-	-	-	*
		50.40000	20.00000	82.00000	-4.4316	0.14409	3.0116	-	-	-	*
		51.60000	20.00000	82.00000	-3.9105	0.11570	2.4223	-	-	-	*
		52.80000	20.00000	82.00000	-3.2573	0.090791	1.8434	-	-	-	*
		54.00000	20.00000	82.00000	-2.6614	0.070716	1.3186	-	-	-	*
		55.20000	20.00000	82.00000	-2.0646	0.052965	0.83826	-	-	-	*
		56.40000	20.00000	82.00000	-1.4671	0.037144	0.38690	-	-	-	*
		57.60000	20.00000	82.00000	-1.0950	0.026578	0.14827	-	-	-	*
		58.80000	20.00000	82.00000	-0.79640	0.018266	0.10346	-	-	-	*
		60.00000	20.00000	82.00000	-0.49750	0.010815	0.072191	-	-	-	*
		0.00000	20.80000	82.00000	3.6375	0.0	0.87634	-	-	-	*
		1.20000	20.80000	82.00000	4.0875	0.0	1.3395	-	-	-	*
		2.40000	20.80000	82.00000	4.5375	0.0	1.9819	-	-	-	*
		3.60000	20.80000	82.00000	4.9875	0.0	2.6744	-	-	-	*
		4.80000	20.80000	82.00000	5.4375	0.0	3.4098	-	-	-	*
		6.00000	20.80000	82.00000	5.9637	0.0	4.1779	-	-	-	*
		7.20000	20.80000	82.00000	6.6157	0.0	4.9652	-	-	-	*
		8.40000	20.80000	82.00000	7.2798	0.0	5.7554	-	-	-	*
		9.60000	20.80000	82.00000	7.9584	0.0	6.5291	-	-	-	*
		10.80000	20.80000	82.00000	8.6538	0.0	7.2637	-	-	-	*
		12.00000	20.80000	82.00000	9.3685	0.0	7.9337	-	-	-	*
		13.20000	20.80000	82.00000	10.105	0.0	8.5104	-	-	-	*
		14.40000	20.80000	82.00000	10.865	0.0	8.9621	-	-	-	*
		15.60000	20.80000	82.00000	11.652	0.0	9.2541	-	-	-	*
		16.80000	20.80000	82.00000	12.468	0.0	9.3486	-	-	-	*
		18.00000	20.80000	82.00000	13.315	0.0	9.2048	-	-	-	*
		19.20000	20.80000	82.00000	14.195	0.0	8.7786	-	-	-	*
		20.40000	20.80000	82.00000	15.112	0.0	8.0231	-	-	-	*
		21.60000	20.80000	82.00000	Point lies within an excavation.						*
		22.80000	20.80000	82.00000	Point lies within an excavation.						*
		24.00000	20.80000	82.00000	Point lies within an excavation.						*
		25.20000	20.80000	82.00000	Point lies within an excavation.						*
		26.40000	20.80000	82.00000	Point lies within an excavation.						*
		27.60000	20.80000	82.00000	Point lies within an excavation.						*
		28.80000	20.80000	82.00000	Point lies within an excavation.						*
		30.00000	20.80000	82.00000	Point lies within an excavation.						*
		31.20000	20.80000	82.00000	Point lies within an excavation.						*
		32.40000	20.80000	82.00000	Point lies within an excavation.						*
		33.60000	20.80000	82.00000	Point lies within an excavation.						*
		34.80000	20.80000	82.00000	Point lies within an excavation.						*
		36.00000	20.80000	82.00000	Point lies within an excavation.						*
		37.20000	20.80000	82.00000	-15.034	0.0	9.0711	-	-	-	*
		38.40000	20.80000	82.00000	-14.121	0.0	9.7704	-	-	-	*
		39.60000	20.80000	82.00000	-13.243	0.0	10.049	-	-	-	*
		40.80000	20.80000	82.00000	-12.399	0.0	9.9751	-	-	-	*
		42.00000	20.80000	82.00000	-11.585	0.0	9.6117	-	-	-	*
		43.20000	20.80000	82.00000	-10.801	0.0	9.0202	-	-	-	*
		44.40000	20.80000	82.00000	-10.043	0.0	8.2585	-	-	-	*
		45.60000	20.80000	82.00000	-9.3081	0.0	7.3816	-	-	-	*

Type/No. Name	Dist.	Coordinates x	y	z	Displacements x	y	z	Angle of Line Along the Line	Perpendicular to Line	x Axis	
		46.80000	20.80000	82.00000	-8.5951	0.0	6.4413	-	-	-	*
		48.00000	20.80000	82.00000	-7.9012	0.0	5.4864	-	-	-	*
		49.20000	20.80000	82.00000	-7.2239	0.0	4.5626	-	-	-	*
		50.40000	20.80000	82.00000	-6.5609	0.0	3.7127	-	-	-	*
		51.60000	20.80000	82.00000	-5.8723	0.0	2.9735	-	-	-	*
		52.80000	20.80000	82.00000	-4.9125	0.0	2.2510	-	-	-	*
		54.00000	20.80000	82.00000	-4.0125	0.0	1.6109	-	-	-	*
		55.20000	20.80000	82.00000	-3.1125	0.0	1.0382	-	-	-	*
		56.40000	20.80000	82.00000	-2.2125	0.0	0.50989	-	-	-	*
		57.60000	20.80000	82.00000	-1.6500	0.0	0.22348	-	-	-	*
		58.80000	20.80000	82.00000	-1.2000	0.0	0.15583	-	-	-	*
		60.00000	20.80000	82.00000	-0.75000	0.0	0.10871	-	-	-	*
		0.00000	21.60000	82.00000	3.6375	0.0	0.87634	-	-	-	*
		1.20000	21.60000	82.00000	4.0875	0.0	1.3395	-	-	-	*
		2.40000	21.60000	82.00000	4.5375	0.0	1.9819	-	-	-	*
		3.60000	21.60000	82.00000	4.9875	0.0	2.6744	-	-	-	*
		4.80000	21.60000	82.00000	5.4375	0.0	3.4098	-	-	-	*
		6.00000	21.60000	82.00000	5.9637	0.0	4.1779	-	-	-	*
		7.20000	21.60000	82.00000	6.6157	0.0	4.9652	-	-	-	*
		8.40000	21.60000	82.00000	7.2798	0.0	5.7554	-	-	-	*
		9.60000	21.60000	82.00000	7.9584	0.0	6.5291	-	-	-	*
		10.80000	21.60000	82.00000	8.6538	0.0	7.2637	-	-	-	*
		12.00000	21.60000	82.00000	9.3685	0.0	7.9337	-	-	-	*
		13.20000	21.60000	82.00000	10.105	0.0	8.5104	-	-	-	*
		14.40000	21.60000	82.00000	10.865	0.0	8.9621	-	-	-	*
		15.60000	21.60000	82.00000	11.652	0.0	9.2541	-	-	-	*
		16.80000	21.60000	82.00000	12.468	0.0	9.3486	-	-	-	*
		18.00000	21.60000	82.00000	13.315	0.0	9.2048	-	-	-	*
		19.20000	21.60000	82.00000	14.195	0.0	8.7786	-	-	-	*
		20.40000	21.60000	82.00000	15.112	0.0	8.0231	-	-	-	*
		21.60000	21.60000	82.00000	Point lies within an excavation.						*
		22.80000	21.60000	82.00000	Point lies within an excavation.						*
		24.00000	21.60000	82.00000	Point lies within an excavation.						*
		25.20000	21.60000	82.00000	Point lies within an excavation.						*
		26.40000	21.60000	82.00000	Point lies within an excavation.						*
		27.60000	21.60000	82.00000	Point lies within an excavation.						*
		28.80000	21.60000	82.00000	Point lies within an excavation.						*
		30.00000	21.60000	82.00000	Point lies within an excavation.						*
		31.20000	21.60000	82.00000	Point lies within an excavation.						*
		32.40000	21.60000	82.00000	Point lies within an excavation.						*
		33.60000	21.60000	82.00000	Point lies within an excavation.						*
		34.80000	21.60000	82.00000	Point lies within an excavation.						*
		36.00000	21.60000	82.00000	Point lies within an excavation.						*
		37.20000	21.60000	82.00000	-15.034	0.0	9.0711	-	-	-	*
		38.40000	21.60000	82.00000	-14.121	0.0	9.7704	-	-	-	*
		39.60000	21.60000	82.00000	-13.243	0.0	10.049	-	-	-	*
		40.80000	21.60000	82.00000	-12.399	0.0	9.9751	-	-	-	*
		42.00000	21.60000	82.00000	-11.585	0.0	9.6117	-	-	-	*
		43.20000	21.60000	82.00000	-10.801	0.0	9.0202	-	-	-	*
		44.40000	21.60000	82.00000	-10.043	0.0	8.2585	-	-	-	*
		45.60000	21.60000	82.00000	-9.3081	0.0	7.3816	-	-	-	*
		46.80000	21.60000	82.00000	-8.5951	0.0	6.4413	-	-	-	*
		48.00000	21.60000	82.00000	-7.9012	0.0	5.4864	-	-	-	*
		49.20000	21.60000	82.00000	-7.2239	0.0	4.5626	-	-	-	*
		50.40000	21.60000	82.00000	-6.5609	0.0	3.7127	-	-	-	*
		51.60000	21.60000	82.00000	-5.8723	0.0	2.9735	-	-	-	*
		52.80000	21.60000	82.00000	-4.9125	0.0	2.2510	-	-	-	*
		54.00000	21.60000	82.00000	-4.0125	0.0	1.6109	-	-	-	*
		55.20000	21.60000	82.00000	-3.1125	0.0	1.0382	-	-	-	*
		56.40000	21.60000	82.00000	-2.2125	0.0	0.50989	-	-	-	*
		57.60000	21.60000	82.00000	-1.6500	0.0	0.22348	-	-	-	*
		58.80000	21.60000	82.00000	-1.2000	0.0	0.15583	-	-	-	*
		60.00000	21.60000	82.00000	-0.75000	0.0	0.10871	-	-	-	*
		0.00000	22.40000	82.00000	3.6375	0.0	0.87634	-	-	-	*
		1.20000	22.40000	82.00000	4.0875	0.0	1.3395	-	-	-	*
		2.40000	22.40000	82.00000	4.5375	0.0	1.9819	-	-	-	*
		3.60000	22.40000	82.00000	4.9875	0.0	2.6744	-	-	-	*
		4.80000	22.40000	82.00000	5.4375	0.0	3.4098	-	-	-	*
		6.00000	22.40000	82.00000	5.9637	0.0	4.1779	-	-	-	*
		7.20000	22.40000	82.00000	6.6157	0.0	4.9652	-	-	-	*
		8.40000	22.40000	82.00000	7.2798	0.0	5.7554	-	-	-	*
		9.60000	22.40000	82.00000	7.9584	0.0	6.5291	-	-	-	*
		10.80000	22.40000	82.00000	8.6538	0.0	7.2637	-	-	-	*
		12.00000	22.40000	82.00000	9.3685	0.0	7.9337	-	-	-	*
		13.20000	22.40000	82.00000	10.105	0.0	8.5104	-	-	-	*
		14.40000	22.40000	82.00000	10.865	0.0	8.9621	-	-	-	*
		15.60000	22.40000	82.00000	11.652	0.0	9.2541	-	-	-	*
		16.80000	22.40000	82.00000	12.468	0.0	9.3486	-	-	-	*
		18.00000	22.40000	82.00000	13.315	0.0	9.2048	-	-	-	*
		19.20000	22.40000	82.00000	14.195	0.0	8.7786	-	-	-	*
		20.40000	22.40000	82.00000	15.112	0.0	8.0231	-	-	-	*
		21.60000	22.40000	82.00000	Point lies within an excavation.						*
		22.80000	22.40000	82.00000	Point lies within an excavation.						*
		24.00000	22.40000	82.00000	Point lies within an excavation.						*
		25.20000	22.40000	82.00000	Point lies within an excavation.						*
		26.40000	22.40000	82.00000	Point lies within an excavation.						*
		27.60000	22.40000	82.00000	Point lies within an excavation.						*
		28.80000	22.40000	82.00000	Point lies within an excavation.						*
		30.00000	22.40000	82.00000	Point lies within an excavation.						*
		31.20000	22.40000	82.00000	Point lies within an excavation.						*
		32.40000	22.40000	82.00000	Point lies within an excavation.						*
		33.60000	22.40000	82.00000	Point lies within an excavation.						*
		34.80000	22.40000	82.00000	Point lies within an excavation.						*
		36.00000	22.40000	82.00000	Point lies within an excavation.						*
		37.20000	22.40000	82.00000	-15.034	0.0	9.0711	-	-	-	*
		38.40000	22.40000	82.00000	-14.121	0.0	9.7704	-	-	-	*
		39.60000	22.40000	82.00000	-13.243	0.0	10.049	-	-	-	*
		40.80000	22.40000	82.00000	-12.399	0.0	9.9751	-	-	-	*
		42.00000	22.40000	82.00000	-11.585	0.0	9.6117	-	-	-	*
		43.20000	22.40000	82.00000	-10.801	0.0	9.0202	-	-	-	*
		44.40000	22.40000	82.00000	-10.043	0.0	8.2585	-	-	-	*
		45.60000	22.40000	82.00000	-9.3081	0.0	7.3816	-	-	-	*
		46.80000	22.40000	82.00000	-8.5951	0.0	6.4413	-	-	-	*
		48.00000	22.40000	82.00000	-7.9012	0.0	5.4864	-	-	-	*
		49.20000	22.40000	82.00000	-7.2239	0.0	4.5626	-	-	-	*
		50.40000	22.40000	82.00000	-6.5609	0.0	3.7127	-	-	-	*
		51.60000	22.40000	82.00000	-5.8723	0.0	2.9735	-	-	-	*
		52.80000	22.40000	82.00000	-4.9125	0.0	2.2510	-	-	-	*
		54.00000	22.40000	82.00000	-4.0125	0.0	1.6109	-	-	-	*
		55.20000	22.40000	82.00000	-3.1125	0.0	1.0382	-	-	-	*
		56.40000	22.40000	82.00000	-2.2125	0.0	0.50989	-	-	-	*
		57.60000	22.40000	82.00000	-1.6500	0.0	0.22348	-	-	-	*
		58.80000	22.40000	82.00000	-1.2000	0.0	0.15583	-	-	-	*
		60.00000	22.40000	82.00000	-0.75000	0.0	0.10871	-	-	-	*
		0.00000	23.20000	82.00000	3.6375	0.0	0.87634	-	-	-	*
		1.20000	23.20000	82.00000	4.0875	0.0	1.3395	-	-	-	*
		2.40000	23.20000	82.00000	4.5375	0.0	1.9819	-	-	-	*
		3.60000	23.20000	82.00000	4.9875	0.0	2.6744	-	-	-	*
		4.80000	23.20000	82.00000	5.4375	0.0	3.4098	-	-	-	*
		6.00000	23.20000	82.00000	5.9637	0.0	4.1779	-	-	-	*
		7.20000	23.20000	82.00000	6.6157	0.0	4.9652	-	-	-	*
		8.40000	23.20000	82.00000	7.2798	0.0	5.7554	-	-	-	*
		9.60000	23.20000	82.00000	7.9584	0.0	6.5291	-	-	-	*
		10.80000	23.20000	82.00000	8.6538	0.0	7.2637	-	-	-	*
		12.00000	23.20000	82.00000	9.3685	0.0	7.9337	-	-	-	*
		13.20000	23.20000	82.00000	10.105	0.0	8.5104	-	-	-	*
		14.40000	23.20000	82.00000	10.865	0.0	8.9621	-	-	-	*
		15.60000	23.20000	82.00000	11.652	0.0	9.2541	-	-	-	*
		16.80000	23.20000	82.00000	12.468	0.0	9.3486	-	-	-	*
		18.00000	23.20000	82.00000	13.315	0.0	9.2048	-	-	-	*
		19.20000	23.20000	82.00000	14.195	0.0	8.7786	-	-	-	*
		20.40000	23.20000	82.00000	15.112	0.0	8.0231	-	-	-	*
		21.60000	23.20000	82.00000	Point lies within an excavation.						*
		22.80000	23.20000	82.00000	Point lies within an excavation.						*
		24.00000	23.20000	82.00000	Point lies within an excavation.						*
		25.20000	23.20000	82.00000	Point lies within an excavation.						*
		26.40000	23.20000	82.00000	Point lies within an excavation.						*
		27.60000	23.20000	82.00000	Point lies within an excavation.						*
		28.80000	23.20000	82.00000	Point lies within an excavation.						*
		30.00000	23.20000	82.00000	Point lies within an excavation.						*
		31.20000	23.20000	82.00000	Point lies within an excavation.						*

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	to x Axis
		32.40000	23.20000	82.00000		Point lies within an excavation.				*
		33.60000	23.20000	82.00000		Point lies within an excavation.				*
		34.80000	23.20000	82.00000		Point lies within an excavation.				*
		36.00000	23.20000	82.00000		Point lies within an excavation.				*
		37.20000	23.20000	82.00000	-15.034	0.0	9.0711	-	-	- *
		38.40000	23.20000	82.00000	-14.121	0.0	9.7704	-	-	- *
		39.60000	23.20000	82.00000	-13.243	0.0	10.049	-	-	- *
		40.80000	23.20000	82.00000	-12.399	0.0	9.9751	-	-	- *
		42.00000	23.20000	82.00000	-11.585	0.0	9.6117	-	-	- *
		43.20000	23.20000	82.00000	-10.801	0.0	9.0202	-	-	- *
		44.40000	23.20000	82.00000	-10.043	0.0	8.2585	-	-	- *
		45.60000	23.20000	82.00000	-9.3081	0.0	7.3816	-	-	- *
		46.80000	23.20000	82.00000	-8.5951	0.0	6.4413	-	-	- *
		48.00000	23.20000	82.00000	-7.9012	0.0	5.4864	-	-	- *
		49.20000	23.20000	82.00000	-7.2239	0.0	4.5626	-	-	- *
		50.40000	23.20000	82.00000	-6.5609	0.0	3.7127	-	-	- *
		51.60000	23.20000	82.00000	-5.8723	0.0	2.9735	-	-	- *
		52.80000	23.20000	82.00000	-4.9125	0.0	2.2510	-	-	- *
		54.00000	23.20000	82.00000	-4.0125	0.0	1.6109	-	-	- *
		55.20000	23.20000	82.00000	-3.1125	0.0	1.0382	-	-	- *
		56.40000	23.20000	82.00000	-2.2125	0.0	0.50989	-	-	- *
		57.60000	23.20000	82.00000	-1.6500	0.0	0.22348	-	-	- *
		58.80000	23.20000	82.00000	-1.2000	0.0	0.15583	-	-	- *
		60.00000	23.20000	82.00000	-0.75000	0.0	0.10871	-	-	- *
		0.00000	24.00000	82.00000	3.6375	0.0	0.87634	-	-	- *
		1.20000	24.00000	82.00000	4.0875	0.0	1.3395	-	-	- *
		2.40000	24.00000	82.00000	4.5375	0.0	1.9819	-	-	- *
		3.60000	24.00000	82.00000	4.9875	0.0	2.6744	-	-	- *
		4.80000	24.00000	82.00000	5.4375	0.0	3.4098	-	-	- *
		6.00000	24.00000	82.00000	5.9637	0.0	4.1779	-	-	- *
		7.20000	24.00000	82.00000	6.6157	0.0	4.9652	-	-	- *
		8.40000	24.00000	82.00000	7.2798	0.0	5.7554	-	-	- *
		9.60000	24.00000	82.00000	7.9584	0.0	6.5291	-	-	- *
		10.80000	24.00000	82.00000	8.6538	0.0	7.2637	-	-	- *
		12.00000	24.00000	82.00000	9.3685	0.0	7.9337	-	-	- *
		13.20000	24.00000	82.00000	10.105	0.0	8.5104	-	-	- *
		14.40000	24.00000	82.00000	10.865	0.0	8.9621	-	-	- *
		15.60000	24.00000	82.00000	11.652	0.0	9.2541	-	-	- *
		16.80000	24.00000	82.00000	12.468	0.0	9.3486	-	-	- *
		18.00000	24.00000	82.00000	13.315	0.0	9.2048	-	-	- *
		19.20000	24.00000	82.00000	14.195	0.0	8.7786	-	-	- *
		20.40000	24.00000	82.00000	15.112	0.0	8.0231	-	-	- *
		21.60000	24.00000	82.00000		Point lies within an excavation.				*
		22.80000	24.00000	82.00000		Point lies within an excavation.				*
		24.00000	24.00000	82.00000		Point lies within an excavation.				*
		25.20000	24.00000	82.00000		Point lies within an excavation.				*
		26.40000	24.00000	82.00000		Point lies within an excavation.				*
		27.60000	24.00000	82.00000		Point lies within an excavation.				*
		28.80000	24.00000	82.00000		Point lies within an excavation.				*
		30.00000	24.00000	82.00000		Point lies within an excavation.				*
		31.20000	24.00000	82.00000		Point lies within an excavation.				*
		32.40000	24.00000	82.00000		Point lies within an excavation.				*
		33.60000	24.00000	82.00000		Point lies within an excavation.				*
		34.80000	24.00000	82.00000		Point lies within an excavation.				*
		36.00000	24.00000	82.00000		Point lies within an excavation.				*
		37.20000	24.00000	82.00000	-15.034	0.0	9.0711	-	-	- *
		38.40000	24.00000	82.00000	-14.121	0.0	9.7704	-	-	- *
		39.60000	24.00000	82.00000	-13.243	0.0	10.049	-	-	- *
		40.80000	24.00000	82.00000	-12.399	0.0	9.9751	-	-	- *
		42.00000	24.00000	82.00000	-11.585	0.0	9.6117	-	-	- *
		43.20000	24.00000	82.00000	-10.801	0.0	9.0202	-	-	- *
		44.40000	24.00000	82.00000	-10.043	0.0	8.2585	-	-	- *
		45.60000	24.00000	82.00000	-9.3081	0.0	7.3816	-	-	- *
		46.80000	24.00000	82.00000	-8.5951	0.0	6.4413	-	-	- *
		48.00000	24.00000	82.00000	-7.9012	0.0	5.4864	-	-	- *
		49.20000	24.00000	82.00000	-7.2239	0.0	4.5626	-	-	- *
		50.40000	24.00000	82.00000	-6.5609	0.0	3.7127	-	-	- *
		51.60000	24.00000	82.00000	-5.8723	0.0	2.9735	-	-	- *
		52.80000	24.00000	82.00000	-4.9125	0.0	2.2510	-	-	- *
		54.00000	24.00000	82.00000	-4.0125	0.0	1.6109	-	-	- *
		55.20000	24.00000	82.00000	-3.1125	0.0	1.0382	-	-	- *
		56.40000	24.00000	82.00000	-2.2125	0.0	0.50989	-	-	- *
		57.60000	24.00000	82.00000	-1.6500	0.0	0.22348	-	-	- *
		58.80000	24.00000	82.00000	-1.2000	0.0	0.15583	-	-	- *
		60.00000	24.00000	82.00000	-0.75000	0.0	0.10871	-	-	- *
		0.00000	24.80000	82.00000	3.6375	0.0	0.87634	-	-	- *
		1.20000	24.80000	82.00000	4.0875	0.0	1.3395	-	-	- *
		2.40000	24.80000	82.00000	4.5375	0.0	1.9819	-	-	- *
		3.60000	24.80000	82.00000	4.9875	0.0	2.6744	-	-	- *
		4.80000	24.80000	82.00000	5.4375	0.0	3.4098	-	-	- *
		6.00000	24.80000	82.00000	5.9637	0.0	4.1779	-	-	- *
		7.20000	24.80000	82.00000	6.6157	0.0	4.9652	-	-	- *
		8.40000	24.80000	82.00000	7.2798	0.0	5.7554	-	-	- *
		9.60000	24.80000	82.00000	7.9584	0.0	6.5291	-	-	- *
		10.80000	24.80000	82.00000	8.6538	0.0	7.2637	-	-	- *
		12.00000	24.80000	82.00000	9.3685	0.0	7.9337	-	-	- *
		13.20000	24.80000	82.00000	10.105	0.0	8.5104	-	-	- *
		14.40000	24.80000	82.00000	10.865	0.0	8.9621	-	-	- *
		15.60000	24.80000	82.00000	11.652	0.0	9.2541	-	-	- *
		16.80000	24.80000	82.00000	12.468	0.0	9.3486	-	-	- *
		18.00000	24.80000	82.00000	13.315	0.0	9.2048	-	-	- *
		19.20000	24.80000	82.00000	14.195	0.0	8.7786	-	-	- *
		20.40000	24.80000	82.00000	15.112	0.0	8.0231	-	-	- *
		21.60000	24.80000	82.00000		Point lies within an excavation.				*
		22.80000	24.80000	82.00000		Point lies within an excavation.				*
		24.00000	24.80000	82.00000		Point lies within an excavation.				*
		25.20000	24.80000	82.00000		Point lies within an excavation.				*
		26.40000	24.80000	82.00000		Point lies within an excavation.				*
		27.60000	24.80000	82.00000		Point lies within an excavation.				*
		28.80000	24.80000	82.00000		Point lies within an excavation.				*
		30.00000	24.80000	82.00000		Point lies within an excavation.				*
		31.20000	24.80000	82.00000		Point lies within an excavation.				*
		32.40000	24.80000	82.00000		Point lies within an excavation.				*
		33.60000	24.80000	82.00000		Point lies within an excavation.				*
		34.80000	24.80000	82.00000		Point lies within an excavation.				*
		36.00000	24.80000	82.00000		Point lies within an excavation.				*
		37.20000	24.80000	82.00000	-15.034	0.0	9.0711	-	-	- *
		38.40000	24.80000	82.00000	-14.121	0.0	9.7704	-	-	- *
		39.60000	24.80000	82.00000	-13.243	0.0	10.049	-	-	- *
		40.80000	24.80000	82.00000	-12.399	0.0	9.9751	-	-	- *
		42.00000	24.80000	82.00000	-11.585	0.0	9.6117	-	-	- *
		43.20000	24.80000	82.00000	-10.801	0.0	9.0202	-	-	- *
		44.40000	24.80000	82.00000	-10.043	0.0	8.2585	-	-	- *
		45.60000	24.80000	82.00000	-9.3081	0.0	7.3816	-	-	- *
		46.80000	24.80000	82.00000	-8.5951	0.0	6.4413	-	-	- *
		48.00000	24.80000	82.00000	-7.9012	0.0	5.4864	-	-	- *
		49.20000	24.80000	82.00000	-7.2239	0.0	4.5626	-	-	- *
		50.40000	24.80000	82.00000	-6.5609	0.0	3.7127	-	-	- *
		51.60000	24.80000	82.00000	-5.8723	0.0	2.9735	-	-	- *
		52.80000	24.80000	82.00000	-4.9125	0.0	2.2510	-	-	- *
		54.00000	24.80000	82.00000	-4.0125	0.0	1.6109	-	-	- *
		55.20000	24.80000	82.00000	-3.1125	0.0	1.0382	-	-	- *
		56.40000	24.80000	82.00000	-2.2125	0.0	0.50989	-	-	- *
		57.60000	24.80000	82.00000	-1.6500	0.0	0.22348	-	-	- *
		58.80000	24.80000	82.00000	-1.2000	0.0	0.15583	-	-	- *
		60.00000	24.80000	82.00000	-0.75000	0.0	0.10871	-	-	- *
		0.00000	25.60000	82.00000	3.6375	0.0	0.87634	-	-	- *
		1.20000	25.60000	82.00000	4.0875	0.0	1.3395	-	-	- *
		2.40000	25.60000	82.00000	4.5375	0.0	1.9819	-	-	- *
		3.60000	25.60000	82.00000	4.9875	0.0	2.6744	-	-	- *
		4.80000	25.60000	82.00000	5.4375	0.0	3.4098	-	-	- *
		6.00000	25.60000	82.00000	5.9637	0.0	4.1779	-	-	- *
		7.20000	25.60000	82.00000	6.6157	0.0	4.9652	-	-	- *
		8.40000	25.60000	82.00000	7.2798	0.0	5.7554	-	-	- *
		9.60000	25.60000	82.00000	7.9584	0.0	6.5291	-	-	- *
		10.80000	25.60000	82.00000	8.6538	0.0	7.2637	-	-	- *
		12.00000	25.60000	82.00000	9.3685	0.0	7.9337	-	-	- *
		13.20000	25.60000	82.00000	10.105	0.0	8.5104	-	-	- *
		14.40000	25.60000	82.00000	10.865	0.0	8.9621	-	-	- *
		15.60000	25.60000	82.00000	11.652	0.0	9.2541	-	-	- *
		16.80000	25.60000	82.00000	12.468	0.0	9.3486	-	-	- *

Type/No. Name	Dist.	Coordinates x	y	z	Displacements x	y	z	Angle of Line Along the Line	Perpendicular to x Axis to Line	
		18.00000	25.60000	82.00000	13.315	0.0	9.2048	-	-	- *
		19.20000	25.60000	82.00000	14.195	0.0	8.7786	-	-	- *
		20.40000	25.60000	82.00000	15.112	0.0	8.0231	-	-	- *
		21.60000	25.60000	82.00000		Point lies within an excavation.				*
		22.80000	25.60000	82.00000		Point lies within an excavation.				*
		24.00000	25.60000	82.00000		Point lies within an excavation.				*
		25.20000	25.60000	82.00000		Point lies within an excavation.				*
		26.40000	25.60000	82.00000		Point lies within an excavation.				*
		27.60000	25.60000	82.00000		Point lies within an excavation.				*
		28.80000	25.60000	82.00000		Point lies within an excavation.				*
		30.00000	25.60000	82.00000		Point lies within an excavation.				*
		31.20000	25.60000	82.00000		Point lies within an excavation.				*
		32.40000	25.60000	82.00000		Point lies within an excavation.				*
		33.60000	25.60000	82.00000		Point lies within an excavation.				*
		34.80000	25.60000	82.00000		Point lies within an excavation.				*
		36.00000	25.60000	82.00000		Point lies within an excavation.				*
		37.20000	25.60000	82.00000	-15.034	0.0	9.0711	-	-	- *
		38.40000	25.60000	82.00000	-14.121	0.0	9.7704	-	-	- *
		39.60000	25.60000	82.00000	-13.243	0.0	10.049	-	-	- *
		40.80000	25.60000	82.00000	-12.399	0.0	9.9751	-	-	- *
		42.00000	25.60000	82.00000	-11.585	0.0	9.6117	-	-	- *
		43.20000	25.60000	82.00000	-10.801	0.0	9.0202	-	-	- *
		44.40000	25.60000	82.00000	-10.043	0.0	8.2585	-	-	- *
		45.60000	25.60000	82.00000	-9.3081	0.0	7.3816	-	-	- *
		46.80000	25.60000	82.00000	-8.5951	0.0	6.4413	-	-	- *
		48.00000	25.60000	82.00000	-7.9012	0.0	5.4864	-	-	- *
		49.20000	25.60000	82.00000	-7.2239	0.0	4.5626	-	-	- *
		50.40000	25.60000	82.00000	-6.5609	0.0	3.7127	-	-	- *
		51.60000	25.60000	82.00000	-5.8723	0.0	2.9735	-	-	- *
		52.80000	25.60000	82.00000	-4.9125	0.0	2.2510	-	-	- *
		54.00000	25.60000	82.00000	-4.0125	0.0	1.6109	-	-	- *
		55.20000	25.60000	82.00000	-3.1125	0.0	1.0382	-	-	- *
		56.40000	25.60000	82.00000	-2.2125	0.0	0.50989	-	-	- *
		57.60000	25.60000	82.00000	-1.6500	0.0	0.22348	-	-	- *
		58.80000	25.60000	82.00000	-1.2000	0.0	0.15583	-	-	- *
		60.00000	25.60000	82.00000	-0.75000	0.0	0.10871	-	-	- *
		0.00000	26.40000	82.00000	3.6375	0.0	0.87634	-	-	- *
		1.20000	26.40000	82.00000	4.0875	0.0	1.3395	-	-	- *
		2.40000	26.40000	82.00000	4.5375	0.0	1.9819	-	-	- *
		3.60000	26.40000	82.00000	4.9875	0.0	2.6744	-	-	- *
		4.80000	26.40000	82.00000	5.4375	0.0	3.4098	-	-	- *
		6.00000	26.40000	82.00000	5.9637	0.0	4.1779	-	-	- *
		7.20000	26.40000	82.00000	6.6157	0.0	4.9652	-	-	- *
		8.40000	26.40000	82.00000	7.2798	0.0	5.7554	-	-	- *
		9.60000	26.40000	82.00000	7.9584	0.0	6.5291	-	-	- *
		10.80000	26.40000	82.00000	8.6538	0.0	7.2637	-	-	- *
		12.00000	26.40000	82.00000	9.3685	0.0	7.9337	-	-	- *
		13.20000	26.40000	82.00000	10.105	0.0	8.5104	-	-	- *
		14.40000	26.40000	82.00000	10.865	0.0	8.9621	-	-	- *
		15.60000	26.40000	82.00000	11.652	0.0	9.2541	-	-	- *
		16.80000	26.40000	82.00000	12.468	0.0	9.3486	-	-	- *
		18.00000	26.40000	82.00000	13.315	0.0	9.2048	-	-	- *
		19.20000	26.40000	82.00000	14.195	0.0	8.7786	-	-	- *
		20.40000	26.40000	82.00000	15.112	0.0	8.0231	-	-	- *
		21.60000	26.40000	82.00000		Point lies within an excavation.				*
		22.80000	26.40000	82.00000		Point lies within an excavation.				*
		24.00000	26.40000	82.00000		Point lies within an excavation.				*
		25.20000	26.40000	82.00000		Point lies within an excavation.				*
		26.40000	26.40000	82.00000		Point lies within an excavation.				*
		27.60000	26.40000	82.00000		Point lies within an excavation.				*
		28.80000	26.40000	82.00000		Point lies within an excavation.				*
		30.00000	26.40000	82.00000		Point lies within an excavation.				*
		31.20000	26.40000	82.00000		Point lies within an excavation.				*
		32.40000	26.40000	82.00000		Point lies within an excavation.				*
		33.60000	26.40000	82.00000		Point lies within an excavation.				*
		34.80000	26.40000	82.00000		Point lies within an excavation.				*
		36.00000	26.40000	82.00000		Point lies within an excavation.				*
		37.20000	26.40000	82.00000	-15.034	0.0	9.0711	-	-	- *
		38.40000	26.40000	82.00000	-14.121	0.0	9.7704	-	-	- *
		39.60000	26.40000	82.00000	-13.243	0.0	10.049	-	-	- *
		40.80000	26.40000	82.00000	-12.399	0.0	9.9751	-	-	- *
		42.00000	26.40000	82.00000	-11.585	0.0	9.6117	-	-	- *
		43.20000	26.40000	82.00000	-10.801	0.0	9.0202	-	-	- *
		44.40000	26.40000	82.00000	-10.043	0.0	8.2585	-	-	- *
		45.60000	26.40000	82.00000	-9.3081	0.0	7.3816	-	-	- *
		46.80000	26.40000	82.00000	-8.5951	0.0	6.4413	-	-	- *
		48.00000	26.40000	82.00000	-7.9012	0.0	5.4864	-	-	- *
		49.20000	26.40000	82.00000	-7.2239	0.0	4.5626	-	-	- *
		50.40000	26.40000	82.00000	-6.5609	0.0	3.7127	-	-	- *
		51.60000	26.40000	82.00000	-5.8723	0.0	2.9735	-	-	- *
		52.80000	26.40000	82.00000	-4.9125	0.0	2.2510	-	-	- *
		54.00000	26.40000	82.00000	-4.0125	0.0	1.6109	-	-	- *
		55.20000	26.40000	82.00000	-3.1125	0.0	1.0382	-	-	- *
		56.40000	26.40000	82.00000	-2.2125	0.0	0.50989	-	-	- *
		57.60000	26.40000	82.00000	-1.6500	0.0	0.22348	-	-	- *
		58.80000	26.40000	82.00000	-1.2000	0.0	0.15583	-	-	- *
		60.00000	26.40000	82.00000	-0.75000	0.0	0.10871	-	-	- *
		0.00000	27.20000	82.00000	3.6375	0.0	0.87634	-	-	- *
		1.20000	27.20000	82.00000	4.0875	0.0	1.3395	-	-	- *
		2.40000	27.20000	82.00000	4.5375	0.0	1.9819	-	-	- *
		3.60000	27.20000	82.00000	4.9875	0.0	2.6744	-	-	- *
		4.80000	27.20000	82.00000	5.4375	0.0	3.4098	-	-	- *
		6.00000	27.20000	82.00000	5.9637	0.0	4.1779	-	-	- *
		7.20000	27.20000	82.00000	6.6157	0.0	4.9652	-	-	- *
		8.40000	27.20000	82.00000	7.2798	0.0	5.7554	-	-	- *
		9.60000	27.20000	82.00000	7.9584	0.0	6.5291	-	-	- *
		10.80000	27.20000	82.00000	8.6538	0.0	7.2637	-	-	- *
		12.00000	27.20000	82.00000	9.3685	0.0	7.9337	-	-	- *
		13.20000	27.20000	82.00000	10.105	0.0	8.5104	-	-	- *
		14.40000	27.20000	82.00000	10.865	0.0	8.9621	-	-	- *
		15.60000	27.20000	82.00000	11.652	0.0	9.2541	-	-	- *
		16.80000	27.20000	82.00000	12.468	0.0	9.3486	-	-	- *
		18.00000	27.20000	82.00000	13.315	0.0	9.2048	-	-	- *
		19.20000	27.20000	82.00000	14.195	0.0	8.7786	-	-	- *
		20.40000	27.20000	82.00000	15.112	0.0	8.0231	-	-	- *
		21.60000	27.20000	82.00000		Point lies within an excavation.				*
		22.80000	27.20000	82.00000		Point lies within an excavation.				*
		24.00000	27.20000	82.00000		Point lies within an excavation.				*
		25.20000	27.20000	82.00000		Point lies within an excavation.				*
		26.40000	27.20000	82.00000		Point lies within an excavation.				*
		27.60000	27.20000	82.00000		Point lies within an excavation.				*
		28.80000	27.20000	82.00000		Point lies within an excavation.				*
		30.00000	27.20000	82.00000		Point lies within an excavation.				*
		31.20000	27.20000	82.00000		Point lies within an excavation.				*
		32.40000	27.20000	82.00000		Point lies within an excavation.				*
		33.60000	27.20000	82.00000		Point lies within an excavation.				*
		34.80000	27.20000	82.00000		Point lies within an excavation.				*
		36.00000	27.20000	82.00000		Point lies within an excavation.				*
		37.20000	27.20000	82.00000	-15.034	0.0	9.0711	-	-	- *
		38.40000	27.20000	82.00000	-14.121	0.0	9.7704	-	-	- *
		39.60000	27.20000	82.00000	-13.243	0.0	10.049	-	-	- *
		40.80000	27.20000	82.00000	-12.399	0.0	9.9751	-	-	- *
		42.00000	27.20000	82.00000	-11.585	0.0	9.6117	-	-	- *
		43.20000	27.20000	82.00000	-10.801	0.0	9.0202	-	-	- *
		44.40000	27.20000	82.00000	-10.043	0.0	8.2585	-	-	- *
		45.60000	27.20000	82.00000	-9.3081	0.0	7.3816	-	-	- *
		46.80000	27.20000	82.00000	-8.5951	0.0	6.4413	-	-	- *
		48.00000	27.20000	82.00000	-7.9012	0.0	5.4864	-	-	- *
		49.20000	27.20000	82.00000	-7.2239	0.0	4.5626	-	-	- *
		50.40000	27.20000	82.00000	-6.5609	0.0	3.7127	-	-	- *
		51.60000	27.20000	82.00000	-5.8723	0.0	2.9735	-	-	- *
		52.80000	27.20000	82.00000	-4.9125	0.0	2.2510	-	-	- *
		54.00000	27.20000	82.00000	-4.0125	0.0	1.6109	-	-	- *
		55.20000	27.20000	82.00000	-3.1125	0.0	1.0382	-	-	- *
		56.40000	27.20000	82.00000	-2.2125	0.0	0.50989	-	-	- *
		57.60000	27.20000	82.00000	-1.6500	0.0	0.22348	-	-	- *
		58.80000	27.20000	82.00000	-1.2000	0.0	0.15583	-	-	- *
		60.00000	27.20000	82.00000	-0.75000	0.0	0.10871	-	-	- *
		0.00000	28.00000	82.00000	2.4157	-0.058919	0.58164	-	-	- *
		1.20000	28.00000	82.00000	2.7132	-0.070290	0.94592	-	-	- *
		2.40000	28.00000	82.00000	3.0101	-0.083153	1.4725	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		3.60000	28.00000	82.00000	3.3064	-0.097823	2.0319	-	-	- *
		4.80000	28.00000	82.00000	3.6018	-0.11471	2.6193	-	-	- *
		6.00000	28.00000	82.00000	3.9710	-0.13693	3.2276	-	-	- *
		7.20000	28.00000	82.00000	4.4657	-0.16788	3.8478	-	-	- *
		8.40000	28.00000	82.00000	4.9705	-0.20539	4.4688	-	-	- *
		9.60000	28.00000	82.00000	5.4873	-0.25171	5.0773	-	-	- *
		10.80000	28.00000	82.00000	6.0173	-0.31017	5.6581	-	-	- *
		12.00000	28.00000	82.00000	6.5613	-0.38596	6.1937	-	-	- *
		13.20000	28.00000	82.00000	7.1187	-0.48758	6.6644	-	-	- *
		14.40000	28.00000	82.00000	7.6866	-0.63005	7.0482	-	-	- *
		15.60000	28.00000	82.00000	8.2559	-0.84244	7.3204	-	-	- *
		16.80000	28.00000	82.00000	8.8007	-1.1893	7.4522	-	-	- *
		18.00000	28.00000	82.00000	9.2315	-1.8463	7.4070	-	-	- *
		19.20000	28.00000	82.00000	9.0558	-3.4830	7.1148	-	-	- *
		20.40000	28.00000	82.00000	2.0876	-10.438	7.0358	-	-	- *
		21.60000	28.00000	82.00000	0.0	-14.802	8.3146	-	-	- *
		22.80000	28.00000	82.00000	0.0	-14.802	8.3146	-	-	- *
		24.00000	28.00000	82.00000	0.0	-14.802	8.3146	-	-	- *
		25.20000	28.00000	82.00000	0.0	-14.802	8.3146	-	-	- *
		26.40000	28.00000	82.00000	0.0	-14.802	8.3146	-	-	- *
		27.60000	28.00000	82.00000	-1.0255	-13.318	8.1149	-	-	- *
		28.80000	28.00000	82.00000	-1.1884	-13.111	8.1951	-	-	- *
		30.00000	28.00000	82.00000	-1.2341	-13.029	8.2862	-	-	- *
		31.20000	28.00000	82.00000	-1.2547	-12.986	8.3876	-	-	- *
		32.40000	28.00000	82.00000	-1.2663	-12.960	8.4910	-	-	- *
		33.60000	28.00000	82.00000	-1.2737	-12.942	8.5882	-	-	- *
		34.80000	28.00000	82.00000	-1.2788	-12.929	8.6719	-	-	- *
		36.00000	28.00000	82.00000	-1.2825	-12.920	8.7364	-	-	- *
		37.20000	28.00000	82.00000	-4.6428	-8.4535	7.5815	-	-	- *
		38.40000	28.00000	82.00000	-9.3316	-2.9269	7.8094	-	-	- *
		39.60000	28.00000	82.00000	-9.2908	-1.5879	7.9813	-	-	- *
		40.80000	28.00000	82.00000	-8.8080	-1.0342	7.8755	-	-	- *
		42.00000	28.00000	82.00000	-8.2429	-0.73675	7.5624	-	-	- *
		43.20000	28.00000	82.00000	-7.6639	-0.55248	7.0897	-	-	- *
		44.40000	28.00000	82.00000	-7.0909	-0.42782	6.4987	-	-	- *
		45.60000	28.00000	82.00000	-6.5306	-0.33830	5.8273	-	-	- *
		46.80000	28.00000	82.00000	-5.9850	-0.27116	5.1109	-	-	- *
		48.00000	28.00000	82.00000	-5.4541	-0.21914	4.3826	-	-	- *
		49.20000	28.00000	82.00000	-4.9368	-0.17774	3.6732	-	-	- *
		50.40000	28.00000	82.00000	-4.4316	-0.14409	3.0116	-	-	- *
		51.60000	28.00000	82.00000	-3.9105	-0.11570	2.4223	-	-	- *
		52.80000	28.00000	82.00000	-3.2573	-0.090791	1.8434	-	-	- *
		54.00000	28.00000	82.00000	-2.6614	-0.070716	1.3186	-	-	- *
		55.20000	28.00000	82.00000	-2.0646	-0.052965	0.83826	-	-	- *
		56.40000	28.00000	82.00000	-1.4671	-0.037144	0.38690	-	-	- *
		57.60000	28.00000	82.00000	-1.0950	-0.026578	0.14827	-	-	- *
		58.80000	28.00000	82.00000	-0.79640	-0.018266	0.10346	-	-	- *
		60.00000	28.00000	82.00000	-0.49750	-0.010815	0.072191	-	-	- *
		0.00000	28.80000	82.00000	2.3724	-0.15044	0.56929	-	-	- *
		1.20000	28.80000	82.00000	2.6623	-0.17933	0.91980	-	-	- *
		2.40000	28.80000	82.00000	2.9507	-0.21193	1.4402	-	-	- *
		3.60000	28.80000	82.00000	3.2370	-0.24900	1.9923	-	-	- *
		4.80000	28.80000	82.00000	3.5207	-0.29152	2.5709	-	-	- *
		6.00000	28.80000	82.00000	3.8676	-0.34675	3.1690	-	-	- *
		7.20000	28.80000	82.00000	4.3436	-0.42456	3.7774	-	-	- *
		8.40000	28.80000	82.00000	4.8252	-0.51841	4.3847	-	-	- *
		9.60000	28.80000	82.00000	5.3125	-0.63360	4.9776	-	-	- *
		10.80000	28.80000	82.00000	5.8041	-0.77787	5.5406	-	-	- *
		12.00000	28.80000	82.00000	6.2964	-0.96297	6.0560	-	-	- *
		13.20000	28.80000	82.00000	6.7811	-1.2076	6.5038	-	-	- *
		14.40000	28.80000	82.00000	7.2407	-1.5431	6.8615	-	-	- *
		15.60000	28.80000	82.00000	7.6362	-2.0259	7.1036	-	-	- *
		16.80000	28.80000	82.00000	7.8705	-2.7653	7.1998	-	-	- *
		18.00000	28.80000	82.00000	7.6593	-3.9828	7.1113	-	-	- *
		19.20000	28.80000	82.00000	5.9949	-5.9949	6.7740	-	-	- *
		20.40000	28.80000	82.00000	0.80044	-10.406	7.3571	-	-	- *
		21.60000	28.80000	82.00000	0.0	-14.195	8.7786	-	-	- *
		22.80000	28.80000	82.00000	0.0	-14.195	8.7786	-	-	- *
		24.00000	28.80000	82.00000	0.0	-14.195	8.7786	-	-	- *
		25.20000	28.80000	82.00000	0.0	-14.195	8.7786	-	-	- *
		26.40000	28.80000	82.00000	0.0	-14.195	8.7786	-	-	- *
		27.60000	28.80000	82.00000	-0.65246	-13.016	8.5283	-	-	- *
		28.80000	28.80000	82.00000	-0.94836	-12.781	8.5986	-	-	- *
		30.00000	28.80000	82.00000	-1.0840	-12.648	8.6939	-	-	- *
		31.20000	28.80000	82.00000	-1.1494	-12.563	8.7959	-	-	- *
		32.40000	28.80000	82.00000	-1.1865	-12.507	8.8988	-	-	- *
		33.60000	28.80000	82.00000	-1.2099	-12.467	8.9952	-	-	- *
		34.80000	28.80000	82.00000	-1.2260	-12.437	9.0784	-	-	- *
		36.00000	28.80000	82.00000	-1.2376	-12.415	9.1427	-	-	- *
		37.20000	28.80000	82.00000	-2.6162	-9.0561	7.8960	-	-	- *
		38.40000	28.80000	82.00000	-6.7733	-5.2628	7.4823	-	-	- *
		39.60000	28.80000	82.00000	-7.9743	-3.4828	7.6925	-	-	- *
		40.80000	28.80000	82.00000	-8.0203	-2.4265	7.6277	-	-	- *
		42.00000	28.80000	82.00000	-7.7136	-1.7824	7.3511	-	-	- *
		43.20000	28.80000	82.00000	-7.2806	-1.3592	6.9107	-	-	- *
		44.40000	28.80000	82.00000	-6.7993	-1.0633	6.3484	-	-	- *
		45.60000	28.80000	82.00000	-6.3011	-0.84656	5.7025	-	-	- *
		46.80000	28.80000	82.00000	-5.8000	-0.68177	5.0084	-	-	- *
		48.00000	28.80000	82.00000	-5.3022	-0.55283	4.2996	-	-	- *
		49.20000	28.80000	82.00000	-4.8105	-0.44950	3.6070	-	-	- *
		50.40000	28.80000	82.00000	-4.3256	-0.36502	2.9596	-	-	- *
		51.60000	28.80000	82.00000	-3.8142	-0.29306	2.3806	-	-	- *
		52.80000	28.80000	82.00000	-3.1847	-0.23066	1.8110	-	-	- *
		54.00000	28.80000	82.00000	-2.6023	-0.17974	1.2933	-	-	- *
		55.20000	28.80000	82.00000	-2.0173	-0.13458	0.81828	-	-	- *
		56.40000	28.80000	82.00000	-1.4301	-0.094248	0.37074	-	-	- *
		57.60000	28.80000	82.00000	-1.0708	-0.067573	0.14480	-	-	- *
		58.80000	28.80000	82.00000	-0.77760	-0.046371	0.10127	-	-	- *
		60.00000	28.80000	82.00000	-0.48351	-0.027329	0.070607	-	-	- *
		0.00000	29.60000	82.00000	2.3186	-0.23751	0.55284	-	-	- *
		1.20000	29.60000	82.00000	2.5998	-0.28288	0.88019	-	-	- *
		2.40000	29.60000	82.00000	2.8780	-0.33391	1.3927	-	-	- *
		3.60000	29.60000	82.00000	3.1526	-0.39174	1.9355	-	-	- *
		4.80000	29.60000	82.00000	3.4225	-0.45779	2.5034	-	-	- *
		6.00000	29.60000	82.00000	3.7376	-0.54130	3.0893	-	-	- *
		7.20000	29.60000	82.00000	4.1899	-0.66156	3.6838	-	-	- *
		8.40000	29.60000	82.00000	4.6420	-0.80564	4.2757	-	-	- *
		9.60000	29.60000	82.00000	5.0916	-0.98096	4.8514	-	-	- *
		10.80000	29.60000	82.00000	5.5340	-1.1981	5.3957	-	-	- *
		12.00000	29.60000	82.00000	5.9600	-1.4725	5.8908	-	-	- *
		13.20000	29.60000	82.00000	6.3522	-1.8274	6.3169	-	-	- *
		14.40000	29.60000	82.00000	6.6773	-2.2987	6.6521	-	-	- *
		15.60000	29.60000	82.00000	6.8673	-2.9431	6.8718	-	-	- *
		16.80000	29.60000	82.00000	6.7742	-3.8448	6.9486	-	-	- *
		18.00000	29.60000	82.00000	6.0570	-5.0879	6.8516	-	-	- *
		19.20000	29.60000	82.00000	4.5567	-7.3609	7.0310	-	-	- *
		20.40000	29.60000	82.00000	0.47646	-10.006	7.5240	-	-	- *
		21.60000	29.60000	82.00000	0.0	-13.604	9.0963	-	-	- *
		22.80000	29.60000	82.00000	0.0	-13.604	9.0963	-	-	- *
		24.00000	29.60000	82.00000	0.0	-13.604	9.0963	-	-	- *
		25.20000	29.60000	82.00000	0.0	-13.604	9.0963	-	-	- *
		26.40000	29.60000	82.00000	0.0	-13.604	9.0963	-	-	- *
		27.60000	29.60000	82.00000	-0.51173	-12.631	8.8459	-	-	- *
		28.80000	29.60000	82.00000	-0.73418	-12.325	8.8499	-	-	- *
		30.00000	29.60000	82.00000	-0.92472	-12.209	8.9440	-	-	- *
		31.20000	29.60000	82.00000	-1.0309	-12.115	9.0438	-	-	- *
		32.40000	29.60000	82.00000	-1.0949	-12.044	9.1439	-	-	- *
		33.60000	29.60000	82.00000	-1.1365	-11.991	9.2376	-	-	- *
		34.80000	29.60000	82.00000	-1.1652	-11.949	9.3183	-	-	- *
		36.00000	29.60000	82.00000	-1.1860	-11.917	9.3808	-	-	- *
		37.20000	29.60000	82.00000	-2.0208	-8.8353	8.0145	-	-	- *
		38.40000	29.60000	82.00000	-5.3706	-6.4491	7.5922	-	-	- *
		39.60000	29.60000	82.00000	-6.5857	-4.5269	7.4177	-	-	- *
		40.80000	29.60000	82.00000	-7.0738	-3.4094	7.3649	-	-	- *
		42.00000	29.60000	82.00000	-7.0479	-2.6078	7.1117	-	-	- *
		43.20000	29.60000	82.00000	-6.7911	-2.0353	6.6981	-	-	- *
		44.40000	29.60000	82.00000	-6.4255	-1.6156	6.1629	-	-	- *
		45.60000	29.60000	82.00000	-6.0072	-1.2987	5.5430	-	-	- *
		46.80000	29.60000	82.00000	-5.5635	-1.0529	4.8734	-	-	- *
		48.00000	29.60000	82.00000	-5.1086	-0.85787	4.1869	-	-	- *
		49.20000	29.60000	82.00000	-4.6499	-0.69990	3.5145	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line	
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line
		50.40000	29.60000	82.00000	-4.1909	-0.56971	2.8851	-	-
		51.60000	29.60000	82.00000	-3.6875	-0.45692	2.3188	-	-
		52.80000	29.60000	82.00000	-3.0916	-0.36150	1.7614	-	-
		54.00000	29.60000	82.00000	-2.5249	-0.28170	1.2534	-	-
		55.20000	29.60000	82.00000	-1.9535	-0.21070	0.78561	-	-
		56.40000	29.60000	82.00000	-1.3782	-0.14708	0.34327	-	-
		57.60000	29.60000	82.00000	-1.0379	-0.10580	0.14002	-	-
		58.80000	29.60000	82.00000	-0.75101	-0.072345	0.098286	-	-
		60.00000	29.60000	82.00000	-0.46246	-0.042225	0.068365	-	-
		0.00000	30.40000	82.00000	2.2551	-0.31901	0.53268	-	-
		1.20000	30.40000	82.00000	2.5265	-0.37963	0.82766	-	-
		2.40000	30.40000	82.00000	2.7934	-0.44757	1.3306	-	-
		3.60000	30.40000	82.00000	3.0549	-0.52421	1.8624	-	-
		4.80000	30.40000	82.00000	3.3094	-0.61129	2.4179	-	-
		6.00000	30.40000	82.00000	3.5839	-0.71679	2.9897	-	-
		7.20000	30.40000	82.00000	4.0089	-0.87412	3.5687	-	-
		8.40000	30.40000	82.00000	4.4269	-1.0610	4.1436	-	-
		9.60000	30.40000	82.00000	4.8333	-1.2859	4.7011	-	-
		10.80000	30.40000	82.00000	5.2198	-1.5606	5.2259	-	-
		12.00000	30.40000	82.00000	5.5720	-1.9010	5.7009	-	-
		13.20000	30.40000	82.00000	5.8646	-2.3298	6.1070	-	-
		14.40000	30.40000	82.00000	6.0524	-2.8774	6.4233	-	-
		15.60000	30.40000	82.00000	6.0523	-3.5820	6.6276	-	-
		16.80000	30.40000	82.00000	5.7092	-4.4748	6.6972	-	-
		18.00000	30.40000	82.00000	4.9574	-5.7506	6.7809	-	-
		19.20000	30.40000	82.00000	3.5031	-7.8146	7.1644	-	-
		20.40000	30.40000	82.00000	0.32991	-9.5673	7.5923	-	-
		21.60000	30.40000	82.00000	0.0	-13.029	9.2819	-	-
		22.80000	30.40000	82.00000	0.0	-13.029	9.2819	-	-
		24.00000	30.40000	82.00000	0.0	-13.029	9.2819	-	-
		25.20000	30.40000	82.00000	0.0	-13.029	9.2819	-	-
		26.40000	30.40000	82.00000	0.0	-13.029	9.2819	-	-
		27.60000	30.40000	82.00000	-0.40909	-12.157	9.0142	-	-
		28.80000	30.40000	82.00000	-0.63599	-11.881	9.0034	-	-
		30.00000	30.40000	82.00000	-0.78115	-11.726	9.0543	-	-
		31.20000	30.40000	82.00000	-0.91330	-11.642	9.1497	-	-
		32.40000	30.40000	82.00000	-0.99947	-11.570	9.2452	-	-
		33.60000	30.40000	82.00000	-1.0580	-11.511	9.3345	-	-
		34.80000	30.40000	82.00000	-1.0994	-11.463	9.4113	-	-
		36.00000	30.40000	82.00000	-1.1300	-11.424	9.4704	-	-
		37.20000	30.40000	82.00000	-1.7185	-8.5095	8.0175	-	-
		38.40000	30.40000	82.00000	-4.3720	-6.9154	7.6432	-	-
		39.60000	30.40000	82.00000	-5.5378	-5.1166	7.2526	-	-
		40.80000	30.40000	82.00000	-6.1344	-4.0104	7.0885	-	-
		42.00000	30.40000	82.00000	-6.3318	-3.1980	6.8486	-	-
		43.20000	30.40000	82.00000	-6.2420	-2.5621	6.4565	-	-
		44.40000	30.40000	82.00000	-5.9965	-2.0689	5.9464	-	-
		45.60000	30.40000	82.00000	-5.6654	-1.6826	5.3526	-	-
		46.80000	30.40000	82.00000	-5.2864	-1.3754	4.7089	-	-
		48.00000	30.40000	82.00000	-4.8806	-1.1272	4.0472	-	-
		49.20000	30.40000	82.00000	-4.4599	-0.92351	3.3979	-	-
		50.40000	30.40000	82.00000	-4.0311	-0.75389	2.7898	-	-
		51.60000	30.40000	82.00000	-3.5335	-0.60335	2.2383	-	-
		52.80000	30.40000	82.00000	-2.9798	-0.48090	1.6958	-	-
		54.00000	30.40000	82.00000	-2.4306	-0.37459	1.1996	-	-
		55.20000	30.40000	82.00000	-1.8745	-0.27959	0.74078	-	-
		56.40000	30.40000	82.00000	-1.3125	-0.19417	0.30482	-	-
		57.60000	30.40000	82.00000	-0.99699	-0.14035	0.13414	-	-
		58.80000	30.40000	82.00000	-0.71714	-0.095400	0.094602	-	-
		60.00000	30.40000	82.00000	-0.43480	-0.054822	0.065480	-	-
		0.00000	31.20000	82.00000	2.1828	-0.39398	0.50923	-	-
		1.20000	31.20000	82.00000	2.4436	-0.46847	0.76291	-	-
		2.40000	31.20000	82.00000	2.6984	-0.55160	1.2548	-	-
		3.60000	31.20000	82.00000	2.9456	-0.64490	1.7741	-	-
		4.80000	31.20000	82.00000	3.1835	-0.75026	2.3154	-	-
		6.00000	31.20000	82.00000	3.4104	-0.87023	2.8717	-	-
		7.20000	31.20000	82.00000	3.8055	-1.0587	3.4337	-	-
		8.40000	31.20000	82.00000	4.1866	-1.2802	3.9904	-	-
		9.60000	31.20000	82.00000	4.5469	-1.5435	4.5288	-	-
		10.80000	31.20000	82.00000	4.8752	-1.8596	5.0339	-	-
		12.00000	31.20000	82.00000	5.1528	-2.2430	5.4893	-	-
		13.20000	31.20000	82.00000	5.3494	-2.7114	5.8769	-	-
		14.40000	31.20000	82.00000	5.4149	-3.2844	6.1775	-	-
		15.60000	31.20000	82.00000	5.2662	-3.9765	6.3718	-	-
		16.80000	31.20000	82.00000	4.7728	-4.7728	6.4416	-	-
		18.00000	31.20000	82.00000	4.2091	-6.2294	6.8231	-	-
		19.20000	31.20000	82.00000	2.7653	-7.8705	7.1998	-	-
		20.40000	31.20000	82.00000	0.24665	-9.1262	7.5774	-	-
		21.60000	31.20000	82.00000	0.0	-12.468	9.3486	-	-
		22.80000	31.20000	82.00000	0.0	-12.468	9.3486	-	-
		24.00000	31.20000	82.00000	0.0	-12.468	9.3486	-	-
		25.20000	31.20000	82.00000	0.0	-12.468	9.3486	-	-
		26.40000	31.20000	82.00000	0.0	-12.468	9.3486	-	-
		27.60000	31.20000	82.00000	-0.33756	-11.653	9.0548	-	-
		28.80000	31.20000	82.00000	-0.56582	-11.428	9.0426	-	-
		30.00000	31.20000	82.00000	-0.67807	-11.235	9.0526	-	-
		31.20000	31.20000	82.00000	-0.80539	-11.152	9.1307	-	-
		32.40000	31.20000	82.00000	-0.90657	-11.086	9.2203	-	-
		33.60000	31.20000	82.00000	-0.97880	-11.028	9.3039	-	-
		34.80000	31.20000	82.00000	-1.0316	-10.978	9.3755	-	-
		36.00000	31.20000	82.00000	-1.0714	-10.935	9.4302	-	-
		37.20000	31.20000	82.00000	-1.5222	-8.1552	7.9272	-	-
		38.40000	31.20000	82.00000	-3.6455	-7.0086	7.5933	-	-
		39.60000	31.20000	82.00000	-4.8271	-5.5627	7.2078	-	-
		40.80000	31.20000	82.00000	-5.2900	-4.3205	6.7977	-	-
		42.00000	31.20000	82.00000	-5.6301	-3.5775	6.5645	-	-
		43.20000	31.20000	82.00000	-5.6750	-2.9418	6.1898	-	-
		44.40000	31.20000	82.00000	-5.5389	-2.4189	5.7028	-	-
		45.60000	31.20000	82.00000	-5.2930	-1.9926	5.1351	-	-
		46.80000	31.20000	82.00000	-4.9802	-1.6439	4.5182	-	-
		48.00000	31.20000	82.00000	-4.6261	-1.3562	3.8832	-	-
		49.20000	31.20000	82.00000	-4.2464	-1.1164	3.2597	-	-
		50.40000	31.20000	82.00000	-3.8503	-0.91429	2.6757	-	-
		51.60000	31.20000	82.00000	-3.3699	-0.73280	2.1407	-	-
		52.80000	31.20000	82.00000	-2.8515	-0.58690	1.6152	-	-
		54.00000	31.20000	82.00000	-2.3213	-0.45668	1.1327	-	-
		55.20000	31.20000	82.00000	-1.7816	-0.33977	0.68442	-	-
		56.40000	31.20000	82.00000	-1.2341	-0.23422	0.25581	-	-
		57.60000	31.20000	82.00000	-0.94878	-0.17041	0.12733	-	-
		58.80000	31.20000	82.00000	-0.67658	-0.11483	0.090310	-	-
		60.00000	31.20000	82.00000	-0.40098	-0.064506	0.061954	-	-
		0.00000	32.00000	82.00000	2.1029	-0.46160	0.48301	-	-
		1.20000	32.00000	82.00000	2.3524	-0.54849	0.68672	-	-
		2.40000	32.00000	82.00000	2.5943	-0.64499	1.1663	-	-
		3.60000	32.00000	82.00000	2.8267	-0.75267	1.6716	-	-
		4.80000	32.00000	82.00000	3.0474	-0.87345	2.1975	-	-
		6.00000	32.00000	82.00000	3.2533	-1.0097	2.7369	-	-
		7.20000	32.00000	82.00000	3.5847	-1.2129	3.2808	-	-
		8.40000	32.00000	82.00000	3.9281	-1.4608	3.8183	-	-
		9.60000	32.00000	82.00000	4.2420	-1.7513	4.3369	-	-
		10.80000	32.00000	82.00000	4.5133	-2.0938	4.8222	-	-
		12.00000	32.00000	82.00000	4.7209	-2.4993	5.2585	-	-
		13.20000	32.00000	82.00000	4.8328	-2.9791	5.6291	-	-
		14.40000	32.00000	82.00000	4.7999	-3.5409	5.9165	-	-
		15.60000	32.00000	82.00000	4.5503	-4.1788	6.1043	-	-
		16.80000	32.00000	82.00000	4.2329	-5.1481	6.4097	-	-
		18.00000	32.00000	82.00000	3.5723	-6.4302	6.7919	-	-
		19.20000	32.00000	82.00000	2.2360	-7.7401	7.1535	-	-
		20.40000	32.00000	82.00000	0.19314	-8.6912	7.4898	-	-
		21.60000	32.00000	82.00000	0.0	-11.921	9.3095	-	-
		22.80000	32.00000	82.00000	0.0	-11.921	9.3095	-	-
		24.00000	32.00000	82.00000	0.0	-11.921	9.3095	-	-
		25.20000	32.00000	82.00000	0.0	-11.921	9.3095	-	-
		26.40000	32.00000	82.00000	0.0	-11.921	9.3095	-	-
		27.60000	32.00000	82.00000	-0.28620	-11.141	8.9848	-	-
		28.80000	32.00000	82.00000	-0.50384	-10.956	8.9703	-	-
		30.00000	32.00000	82.00000	-0.63082	-10.782	8.9751	-	-
		31.20000	32.00000	82.00000	-0.71088	-10.651	9.0026	-	-
		32.40000	32.00000	82.00000	-0.82015	-10.596	9.0855	-	-
		33.60000	32.00000	82.00000	-0.90213	-10.542	9.1625	-	-
		34.80000	32.00000	82.00000	-0.96421	-10.493	9.2281	-	-

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		36.00000	32.00000	82.00000	-1.0120	-10.450	9.2774	-	-	- *
		37.20000	32.00000	82.00000	-1.3761	-7.7915	7.7580	-	-	- *
		38.40000	32.00000	82.00000	-3.1054	-6.9204	7.4585	-	-	- *
		39.60000	32.00000	82.00000	-4.2112	-5.7578	7.0870	-	-	- *
		40.80000	32.00000	82.00000	-4.7355	-4.6309	6.6535	-	-	- *
		42.00000	32.00000	82.00000	-4.9805	-3.7873	6.2617	-	-	- *
		43.20000	32.00000	82.00000	-5.1211	-3.1902	5.9015	-	-	- *
		44.40000	32.00000	82.00000	-5.0752	-2.6702	5.4362	-	-	- *
		45.60000	32.00000	82.00000	-4.9060	-2.2286	4.8941	-	-	- *
		46.80000	32.00000	82.00000	-4.6562	-1.8565	4.3049	-	-	- *
		48.00000	32.00000	82.00000	-4.3533	-1.5424	3.6980	-	-	- *
		49.20000	32.00000	82.00000	-4.0151	-1.2762	3.1023	-	-	- *
		50.40000	32.00000	82.00000	-3.6529	-1.0487	2.5452	-	-	- *
		51.60000	32.00000	82.00000	-3.2046	-0.84643	2.0277	-	-	- *
		52.80000	32.00000	82.00000	-2.7091	-0.67794	1.5211	-	-	- *
		54.00000	32.00000	82.00000	-2.1988	-0.52660	1.0539	-	-	- *
		55.20000	32.00000	82.00000	-1.6764	-0.38999	0.61724	-	-	- *
		56.40000	32.00000	82.00000	-1.1529	-0.26743	0.19443	-	-	- *
		57.60000	32.00000	82.00000	-0.89404	-0.19530	0.11985	-	-	- *
		58.80000	32.00000	82.00000	-0.62996	-0.13004	0.085506	-	-	- *
		60.00000	32.00000	82.00000	-0.36155	-0.070739	0.057765	-	-	- *
		0.00000	32.80000	82.00000	2.0161	-0.52124	0.45455	-	-	- *
		1.20000	32.80000	82.00000	2.2541	-0.61900	0.60357	-	-	- *
		2.40000	32.80000	82.00000	2.4827	-0.72699	1.0660	-	-	- *
		3.60000	32.80000	82.00000	2.7000	-0.84675	1.5562	-	-	- *
		4.80000	32.80000	82.00000	2.9033	-0.98009	2.0655	-	-	- *
		6.00000	32.80000	82.00000	3.0891	-1.1291	2.5869	-	-	- *
		7.20000	32.80000	82.00000	3.3517	-1.3356	3.1117	-	-	- *
		8.40000	32.80000	82.00000	3.6578	-1.6022	3.6294	-	-	- *
		9.60000	32.80000	82.00000	3.9273	-1.9096	4.1278	-	-	- *
		10.80000	32.80000	82.00000	4.1457	-2.2652	4.5933	-	-	- *
		12.00000	32.80000	82.00000	4.2914	-2.6758	5.0111	-	-	- *
		13.20000	32.80000	82.00000	4.3335	-3.1462	5.3658	-	-	- *
		14.40000	32.80000	82.00000	4.2284	-3.6739	5.6419	-	-	- *
		15.60000	32.80000	82.00000	4.0188	-4.3469	5.9159	-	-	- *
		16.80000	32.80000	82.00000	3.7325	-5.3465	6.3200	-	-	- *
		18.00000	32.80000	82.00000	3.0450	-6.4554	6.6950	-	-	- *
		19.20000	32.80000	82.00000	1.8434	-7.5155	7.0375	-	-	- *
		20.40000	32.80000	82.00000	0.15595	-8.2652	7.3385	-	-	- *
		21.60000	32.80000	82.00000	0.0	-11.387	9.1768	-	-	- *
		22.80000	32.80000	82.00000	0.0	-11.387	9.1768	-	-	- *
		24.00000	32.80000	82.00000	0.0	-11.387	9.1768	-	-	- *
		25.20000	32.80000	82.00000	0.0	-11.387	9.1768	-	-	- *
		26.40000	32.80000	82.00000	0.0	-11.387	9.1768	-	-	- *
		27.60000	32.80000	82.00000	-0.24795	-10.631	8.8191	-	-	- *
		28.80000	32.80000	82.00000	-0.45131	-10.477	8.8019	-	-	- *
		30.00000	32.80000	82.00000	-0.58421	-10.321	8.8015	-	-	- *
		31.20000	32.80000	82.00000	-0.66368	-10.185	8.8116	-	-	- *
		32.40000	32.80000	82.00000	-0.74213	-10.103	8.8562	-	-	- *
		33.60000	32.80000	82.00000	-0.83008	-10.056	8.9261	-	-	- *
		34.80000	32.80000	82.00000	-0.89899	-10.011	8.9849	-	-	- *
		36.00000	32.80000	82.00000	-0.95338	-9.9686	9.0282	-	-	- *
		37.20000	32.80000	82.00000	-1.2584	-7.4253	7.5219	-	-	- *
		38.40000	32.80000	82.00000	-2.6901	-6.7369	7.2522	-	-	- *
		39.60000	32.80000	82.00000	-3.6910	-5.7908	6.8989	-	-	- *
		40.80000	32.80000	82.00000	-4.2460	-4.8113	6.4760	-	-	- *
		42.00000	32.80000	82.00000	-4.4561	-3.9302	5.9942	-	-	- *
		43.20000	32.80000	82.00000	-4.5996	-3.3291	5.5949	-	-	- *
		44.40000	32.80000	82.00000	-4.6222	-2.8332	5.1501	-	-	- *
		45.60000	32.80000	82.00000	-4.5178	-2.3950	4.6334	-	-	- *
		46.80000	32.80000	82.00000	-4.3246	-2.0144	4.0723	-	-	- *
		48.00000	32.80000	82.00000	-4.0698	-1.6857	3.4949	-	-	- *
		49.20000	32.80000	82.00000	-3.7719	-1.4019	2.9288	-	-	- *
		50.40000	32.80000	82.00000	-3.4433	-1.1559	2.4007	-	-	- *
		51.60000	32.80000	82.00000	-3.0270	-0.94052	1.9011	-	-	- *
		52.80000	32.80000	82.00000	-2.5548	-0.75293	1.4149	-	-	- *
		54.00000	32.80000	82.00000	-2.0649	-0.58328	0.96420	-	-	- *
		55.20000	32.80000	82.00000	-1.5604	-0.42928	0.54004	-	-	- *
		56.40000	32.80000	82.00000	-1.0829	-0.29583	0.16020	-	-	- *
		57.60000	32.80000	82.00000	-0.83357	-0.21446	0.11192	-	-	- *
		58.80000	32.80000	82.00000	-0.57796	-0.14051	0.080268	-	-	- *
		60.00000	32.80000	82.00000	-0.31706	-0.073062	0.052859	-	-	- *
		0.00000	33.60000	82.00000	1.9237	-0.57242	0.42442	-	-	- *
		1.20000	33.60000	82.00000	2.1499	-0.67950	0.56379	-	-	- *
		2.40000	33.60000	82.00000	2.3652	-0.79712	0.95517	-	-	- *
		3.60000	33.60000	82.00000	2.5674	-0.92670	1.4293	-	-	- *
		4.80000	33.60000	82.00000	2.7535	-1.0698	1.9210	-	-	- *
		6.00000	33.60000	82.00000	2.9198	-1.2283	2.4236	-	-	- *
		7.20000	33.60000	82.00000	3.1110	-1.4269	2.9286	-	-	- *
		8.40000	33.60000	82.00000	3.3818	-1.7049	3.4259	-	-	- *
		9.60000	33.60000	82.00000	3.6103	-2.0204	3.9038	-	-	- *
		10.80000	33.60000	82.00000	3.7817	-2.3782	4.3496	-	-	- *
		12.00000	33.60000	82.00000	3.8754	-2.7812	4.7495	-	-	- *
		13.20000	33.60000	82.00000	3.8636	-3.2285	5.0892	-	-	- *
		14.40000	33.60000	82.00000	3.7102	-3.7102	5.3551	-	-	- *
		15.60000	33.60000	82.00000	3.6211	-4.5079	5.7808	-	-	- *
		16.80000	33.60000	82.00000	3.2844	-5.4149	6.1775	-	-	- *
		18.00000	33.60000	82.00000	2.6103	-6.3692	6.5399	-	-	- *
		19.20000	33.60000	82.00000	1.5431	-7.2407	6.8615	-	-	- *
		20.40000	33.60000	82.00000	0.12868	-7.8493	7.1316	-	-	- *
		21.60000	33.60000	82.00000	0.0	-10.865	8.9621	-	-	- *
		22.80000	33.60000	82.00000	0.0	-10.865	8.9621	-	-	- *
		24.00000	33.60000	82.00000	0.0	-10.865	8.9621	-	-	- *
		25.20000	33.60000	82.00000	0.0	-10.865	8.9621	-	-	- *
		26.40000	33.60000	82.00000	0.0	-10.865	8.9621	-	-	- *
		27.60000	33.60000	82.00000	-0.21849	-10.127	8.5713	-	-	- *
		28.80000	33.60000	82.00000	-0.40725	-9.9953	8.5513	-	-	- *
		30.00000	33.60000	82.00000	-0.54079	-9.8577	8.5456	-	-	- *
		31.20000	33.60000	82.00000	-0.62829	-9.7307	8.5491	-	-	- *
		32.40000	33.60000	82.00000	-0.68273	-9.6211	8.5565	-	-	- *
		33.60000	33.60000	82.00000	-0.76375	-9.5714	8.6092	-	-	- *
		34.80000	33.60000	82.00000	-0.83720	-9.5305	8.6609	-	-	- *
		36.00000	33.60000	82.00000	-0.89665	-9.4910	8.6976	-	-	- *
		37.20000	33.60000	82.00000	-1.1588	-7.0596	7.2296	-	-	- *
		38.40000	33.60000	82.00000	-2.3606	-6.4997	6.9858	-	-	- *
		39.60000	33.60000	82.00000	-3.2533	-5.7190	6.6528	-	-	- *
		40.80000	33.60000	82.00000	-3.8029	-4.8727	6.2453	-	-	- *
		42.00000	33.60000	82.00000	-4.0607	-4.0710	5.7767	-	-	- *
		43.20000	33.60000	82.00000	-4.1203	-3.3806	5.2732	-	-	- *
		44.40000	33.60000	82.00000	-4.1913	-2.9204	4.8481	-	-	- *
		45.60000	33.60000	82.00000	-4.1382	-2.4984	4.3565	-	-	- *
		46.80000	33.60000	82.00000	-3.9936	-2.1210	3.8240	-	-	- *
		48.00000	33.60000	82.00000	-3.7821	-1.7874	3.2770	-	-	- *
		49.20000	33.60000	82.00000	-3.5219	-1.4939	2.7420	-	-	- *
		50.40000	33.60000	82.00000	-3.2256	-1.2356	2.2446	-	-	- *
		51.60000	33.60000	82.00000	-2.8401	-1.0145	1.7629	-	-	- *
		52.80000	33.60000	82.00000	-2.3910	-0.81119	1.2981	-	-	- *
		54.00000	33.60000	82.00000	-1.9215	-0.62601	0.86474	-	-	- *
		55.20000	33.60000	82.00000	-1.4352	-0.45690	0.45358	-	-	- *
		56.40000	33.60000	82.00000	-1.0078	-0.31687	0.14687	-	-	- *
		57.60000	33.60000	82.00000	-0.76822	-0.22748	0.10376	-	-	- *
		58.80000	33.60000	82.00000	-0.52127	-0.14586	0.074643	-	-	- *
		60.00000	33.60000	82.00000	-0.26809	-0.071103	0.047134	-	-	- *
		0.00000	34.40000	82.00000	1.8267	-0.61482	0.39319	-	-	- *
		1.20000	34.40000	82.00000	2.0411	-0.72972	0.52249	-	-	- *
		2.40000	34.40000	82.00000	2.2433	-0.85517	0.83483	-	-	- *
		3.60000	34.40000	82.00000	2.4307	-0.99242	1.2921	-	-	- *
		4.80000	34.40000	82.00000	2.6003	-1.1428	1.7655	-	-	- *
		6.00000	34.40000	82.00000	2.7481	-1.3077	2.2486	-	-	- *
		7.20000	34.40000	82.00000	2.8669	-1.4874	2.7332	-	-	- *
		8.40000	34.40000	82.00000	3.1052	-1.7707	3.2097	-	-	- *
		9.60000	34.40000	82.00000	3.2970	-2.0871	3.6672	-	-	- *
		10.80000	34.40000	82.00000	3.4284	-2.4388	4.0934	-	-	- *
		12.00000	34.40000	82.00000	3.4805	-2.8253	4.4758	-	-	- *
		13.20000	34.40000	82.00000	3.4295	-3.2416	4.8012	-	-	- *
		14.40000	34.40000	82.00000	3.3861	-3.8302	5.1867	-	-	- *
		15.60000	34.40000	82.00000	3.2490	-4.5752	5.6029	-	-	- *
		16.80000	34.40000	82.00000	2.8898	-5.3891	5.9877	-	-	- *
		18.00000	34.40000	82.00000	2.2505	-6.2113	6.3342	-	-	- *
		19.20000	34.40000	82.00000	1.3072	-6.9383	6.6343	-	-	- *
		20.40000	34.40000	82.00000	0.10788	-7.4436	6.8768	-	-	- *

Type/No.		Coordinates			Displacements			Angle of Line	
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line
		21.60000	34.40000	82.00000	0.0	-10.355	8.6765	-	-
		22.80000	34.40000	82.00000	0.0	-10.355	8.6765	-	-
		24.00000	34.40000	82.00000	0.0	-10.355	8.6765	-	-
		25.20000	34.40000	82.00000	0.0	-10.355	8.6765	-	-
		26.40000	34.40000	82.00000	0.0	-10.355	8.6765	-	-
		27.60000	34.40000	82.00000	-0.19518	-9.6298	8.2541	-	-
		28.80000	34.40000	82.00000	-0.37021	-9.5161	8.2314	-	-
		30.00000	34.40000	82.00000	-0.50140	-9.3940	8.2206	-	-
		31.20000	34.40000	82.00000	-0.59343	-9.2767	8.2175	-	-
		32.40000	34.40000	82.00000	-0.65502	-9.1715	8.2175	-	-
		33.60000	34.40000	82.00000	-0.70353	-9.0892	8.2255	-	-
		34.80000	34.40000	82.00000	-0.77957	-9.0536	8.2698	-	-
		36.00000	34.40000	82.00000	-0.84257	-9.0175	8.2998	-	-
		37.20000	34.40000	82.00000	-1.0722	-6.6961	6.8907	-	-
		38.40000	34.40000	82.00000	-2.0922	-6.2310	6.6696	-	-
		39.60000	34.40000	82.00000	-2.8833	-5.5780	6.3575	-	-
		40.80000	34.40000	82.00000	-3.4078	-4.8468	5.9687	-	-
		42.00000	34.40000	82.00000	-3.6888	-4.1257	5.5176	-	-
		43.20000	34.40000	82.00000	-3.7774	-3.4659	5.0185	-	-
		44.40000	34.40000	82.00000	-3.7886	-2.9451	4.5335	-	-
		45.60000	34.40000	82.00000	-3.7744	-2.5471	4.0670	-	-
		46.80000	34.40000	82.00000	-3.6697	-2.1810	3.5633	-	-
		48.00000	34.40000	82.00000	-3.4959	-1.8500	3.0475	-	-
		49.20000	34.40000	82.00000	-3.2697	-1.5534	2.5447	-	-
		50.40000	34.40000	82.00000	-3.0182	-1.2960	2.0798	-	-
		51.60000	34.40000	82.00000	-2.6464	-1.0683	1.6150	-	-
		52.80000	34.40000	82.00000	-2.2197	-0.85242	1.1723	-	-
		54.00000	34.40000	82.00000	-1.7704	-0.65435	0.75664	-	-
		55.20000	34.40000	82.00000	-1.3023	-0.47236	0.35864	-	-
		56.40000	34.40000	82.00000	-0.92859	-0.33027	0.13360	-	-
		57.60000	34.40000	82.00000	-0.69880	-0.23406	0.095547	-	-
		58.80000	34.40000	82.00000	-0.46057	-0.14578	0.068631	-	-
		60.00000	34.40000	82.00000	-0.21522	-0.064567	0.040427	-	-
		0.00000	35.20000	82.00000	1.7259	-0.64828	0.36145	-	-
		1.20000	35.20000	82.00000	1.9288	-0.76953	0.48040	-	-
		2.40000	35.20000	82.00000	2.1182	-0.90112	0.70618	-	-
		3.60000	35.20000	82.00000	2.2915	-1.0441	1.1460	-	-
		4.80000	35.20000	82.00000	2.4454	-1.1994	1.6005	-	-
		6.00000	35.20000	82.00000	2.5760	-1.3680	2.0636	-	-
		7.20000	35.20000	82.00000	2.6782	-1.5506	2.5276	-	-
		8.40000	35.20000	82.00000	2.8321	-1.8023	2.9832	-	-
		9.60000	35.20000	82.00000	2.9923	-2.1139	3.4201	-	-
		10.80000	35.20000	82.00000	3.0907	-2.4535	3.8271	-	-
		12.00000	35.20000	82.00000	3.1109	-2.8181	4.1923	-	-
		13.20000	35.20000	82.00000	3.0918	-3.2612	4.5543	-	-
		14.40000	35.20000	82.00000	3.0748	-3.8813	4.9835	-	-
		15.60000	35.20000	82.00000	2.9074	-4.5688	5.3866	-	-
		16.80000	35.20000	82.00000	2.5446	-5.2955	5.7564	-	-
		18.00000	35.20000	82.00000	1.9502	-6.0067	6.0850	-	-
		19.20000	35.20000	82.00000	1.1179	-6.6211	6.3634	-	-
		20.40000	35.20000	82.00000	0.091530	-7.0478	6.5811	-	-
		21.60000	35.20000	82.00000	0.0	-9.8568	8.3304	-	-
		22.80000	35.20000	82.00000	0.0	-9.8568	8.3304	-	-
		24.00000	35.20000	82.00000	0.0	-9.8568	8.3304	-	-
		25.20000	35.20000	82.00000	0.0	-9.8568	8.3304	-	-
		26.40000	35.20000	82.00000	0.0	-9.8568	8.3304	-	-
		27.60000	35.20000	82.00000	-0.17630	-9.1409	7.8791	-	-
		28.80000	35.20000	82.00000	-0.33886	-9.0413	7.8539	-	-
		30.00000	35.20000	82.00000	-0.46612	-8.9323	7.8383	-	-
		31.20000	35.20000	82.00000	-0.56018	-8.8245	7.8289	-	-
		32.40000	35.20000	82.00000	-0.62679	-8.7248	7.8219	-	-
		33.60000	35.20000	82.00000	-0.67253	-8.6362	7.8134	-	-
		34.80000	35.20000	82.00000	-0.72638	-8.5807	7.8246	-	-
		36.00000	35.20000	82.00000	-0.79163	-8.5485	7.8478	-	-
		37.20000	35.20000	82.00000	-0.99549	-6.3356	6.5140	-	-
		38.40000	35.20000	82.00000	-1.8689	-5.9432	6.3131	-	-
		39.60000	35.20000	82.00000	-2.5680	-5.3906	6.0217	-	-
		40.80000	35.20000	82.00000	-3.0575	-4.7570	5.6535	-	-
		42.00000	35.20000	82.00000	-3.3448	-4.1122	5.2228	-	-
		43.20000	35.20000	82.00000	-3.4623	-3.5028	4.7446	-	-
		44.40000	35.20000	82.00000	-3.4491	-2.9525	4.2344	-	-
		45.60000	35.20000	82.00000	-3.4307	-2.5491	3.7681	-	-
		46.80000	35.20000	82.00000	-3.3575	-2.1997	3.2936	-	-
		48.00000	35.20000	82.00000	-3.2153	-1.8770	2.8095	-	-
		49.20000	35.20000	82.00000	-3.0191	-1.5824	2.3400	-	-
		50.40000	35.20000	82.00000	-2.8238	-1.3462	1.9067	-	-
		51.60000	35.20000	82.00000	-2.4483	-1.1022	1.4592	-	-
		52.80000	35.20000	82.00000	-2.0432	-0.87663	1.0389	-	-
		54.00000	35.20000	82.00000	-1.6135	-0.66815	0.64098	-	-
		55.20000	35.20000	82.00000	-1.1631	-0.47540	0.25591	-	-
		56.40000	35.20000	82.00000	-0.84629	-0.33590	0.12072	-	-
		57.60000	35.20000	82.00000	-0.62610	-0.23403	0.087404	-	-
		58.80000	35.20000	82.00000	-0.39655	-0.14007	0.062166	-	-
		60.00000	35.20000	82.00000	-0.15904	-0.053244	0.032497	-	-
		0.00000	36.00000	82.00000	1.6225	-0.67275	0.32973	-	-
		1.20000	36.00000	82.00000	1.8142	-0.79901	0.43819	-	-
		2.40000	36.00000	82.00000	1.9914	-0.93517	0.57038	-	-
		3.60000	36.00000	82.00000	2.1513	-1.0820	0.99234	-	-
		4.80000	36.00000	82.00000	2.2906	-1.2402	1.4277	-	-
		6.00000	36.00000	82.00000	2.4056	-1.4102	1.8705	-	-
		7.20000	36.00000	82.00000	2.4912	-1.5922	2.3135	-	-
		8.40000	36.00000	82.00000	2.5659	-1.8025	2.7482	-	-
		9.60000	36.00000	82.00000	2.6995	-2.1052	3.1647	-	-
		10.80000	36.00000	82.00000	2.7717	-2.4288	3.5526	-	-
		12.00000	36.00000	82.00000	2.7687	-2.7687	3.9010	-	-
		13.20000	36.00000	82.00000	2.8276	-3.2924	4.3351	-	-
		14.40000	36.00000	82.00000	2.7812	-3.8754	4.7495	-	-
		15.60000	36.00000	82.00000	2.5970	-4.5051	5.1368	-	-
		16.80000	36.00000	82.00000	2.2430	-5.1528	5.4893	-	-
		18.00000	36.00000	82.00000	1.6974	-5.7711	5.7987	-	-
		19.20000	36.00000	82.00000	0.96297	-6.2964	6.0560	-	-
		20.40000	36.00000	82.00000	0.078372	-6.6616	6.2512	-	-
		21.60000	36.00000	82.00000	0.0	-9.3685	7.9337	-	-
		22.80000	36.00000	82.00000	0.0	-9.3685	7.9337	-	-
		24.00000	36.00000	82.00000	0.0	-9.3685	7.9337	-	-
		25.20000	36.00000	82.00000	0.0	-9.3685	7.9337	-	-
		26.40000	36.00000	82.00000	0.0	-9.3685	7.9337	-	-
		27.60000	36.00000	82.00000	-0.16071	-8.6603	7.4573	-	-
		28.80000	36.00000	82.00000	-0.31212	-8.5719	7.4299	-	-
		30.00000	36.00000	82.00000	-0.43468	-8.4741	7.4099	-	-
		31.20000	36.00000	82.00000	-0.52905	-8.3753	7.3947	-	-
		32.40000	36.00000	82.00000	-0.59895	-8.2814	7.3808	-	-
		33.60000	36.00000	82.00000	-0.64926	-8.1958	7.3652	-	-
		34.80000	36.00000	82.00000	-0.68468	-8.1197	7.3450	-	-
		36.00000	36.00000	82.00000	-0.74407	-8.0842	7.3537	-	-
		37.20000	36.00000	82.00000	-0.92684	-5.9789	6.1079	-	-
		38.40000	36.00000	82.00000	-1.6797	-5.6439	5.9248	-	-
		39.60000	36.00000	82.00000	-2.2970	-5.1716	5.6536	-	-
		40.80000	36.00000	82.00000	-2.7473	-4.6203	5.3069	-	-
		42.00000	36.00000	82.00000	-3.0297	-4.0451	4.8988	-	-
		43.20000	36.00000	82.00000	-3.1639	-3.4867	4.4441	-	-
		44.40000	36.00000	82.00000	-3.1781	-2.9692	3.9582	-	-
		45.60000	36.00000	82.00000	-3.1091	-2.5122	3.4633	-	-
		46.80000	36.00000	82.00000	-3.0599	-2.1826	3.0180	-	-
		48.00000	36.00000	82.00000	-2.9437	-1.8719	2.5662	-	-
		49.20000	36.00000	82.00000	-2.7730	-1.5834	2.1307	-	-
		50.40000	36.00000	82.00000	-2.6015	-1.3665	1.7187	-	-
		51.60000	36.00000	82.00000	-2.2479	-1.1169	1.2975	-	-
		52.80000	36.00000	82.00000	-1.8631	-0.88412	0.89920	-	-
		54.00000	36.00000	82.00000	-1.4522	-0.66747	0.51870	-	-
		55.20000	36.00000	82.00000	-1.0190	-0.46593	0.16775	-	-
		56.40000	36.00000	82.00000	-0.76174	-0.33375	0.10848	-	-
		57.60000	36.00000	82.00000	-0.55090	-0.22731	0.079375	-	-
		58.80000	36.00000	82.00000	-0.32986	-0.12862	0.055095	-	-
		60.00000	36.00000	82.00000	-0.10010	-0.036994	0.023011	-	-
		0.00000	36.80000	82.00000	1.5173	-0.68831	0.29858	-	-
		1.20000	36.80000	82.00000	1.6983	-0.81833	0.39654	-	-
		2.40000	36.80000	82.00000	1.8638	-0.95765	0.51590	-	-
		3.60000	36.80000	82.00000	2.0112	-1.1068	0.83242	-	-
		4.80000	36.80000	82.00000	2.1373	-1.2661	1.2483	-	-
		6.00000	36.80000	82.00000	2.2383	-1.4356	1.6708	-	-

Type/No.		Coordinates			Displacements			Angle of Line			
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis	
		7.20000	36.80000	82.00000	2.3096	-1.6150	2.0929	-	-	-	*
		8.40000	36.80000	82.00000	2.3459	-1.8031	2.5067	-	-	-	*
		9.60000	36.80000	82.00000	2.4208	-2.0655	2.9030	-	-	-	*
		10.80000	36.80000	82.00000	2.4729	-2.3710	3.2721	-	-	-	*
		12.00000	36.80000	82.00000	2.5407	-2.7798	3.6736	-	-	-	*
		13.20000	36.80000	82.00000	2.5737	-3.2788	4.0913	-	-	-	*
		14.40000	36.80000	82.00000	2.5074	-3.8228	4.4887	-	-	-	*
		15.60000	36.80000	82.00000	2.3167	-4.3970	4.8583	-	-	-	*
		16.80000	36.80000	82.00000	1.9791	-4.9745	5.1921	-	-	-	*
		18.00000	36.80000	82.00000	1.4825	-5.5151	5.4818	-	-	-	*
		19.20000	36.80000	82.00000	0.83429	-5.9684	5.7186	-	-	-	*
		20.40000	36.80000	82.00000	0.067575	-6.2845	5.8933	-	-	-	*
		21.60000	36.80000	82.00000	0.0	-8.8898	7.4956	-	-	-	*
		22.80000	36.80000	82.00000	0.0	-8.8898	7.4956	-	-	-	*
		24.00000	36.80000	82.00000	0.0	-8.8898	7.4956	-	-	-	*
		25.20000	36.80000	82.00000	0.0	-8.8898	7.4956	-	-	-	*
		26.40000	36.80000	82.00000	0.0	-8.8898	7.4956	-	-	-	*
		27.60000	36.80000	82.00000	-0.14763	-8.1879	6.9987	-	-	-	*
		28.80000	36.80000	82.00000	-0.28910	-8.1087	6.9694	-	-	-	*
		30.00000	36.80000	82.00000	-0.40667	-8.0203	6.9456	-	-	-	*
		31.20000	36.80000	82.00000	-0.50021	-7.9295	6.9250	-	-	-	*
		32.40000	36.80000	82.00000	-0.57207	-7.8415	6.9048	-	-	-	*
		33.60000	36.80000	82.00000	-0.62580	-7.7595	6.8825	-	-	-	*
		34.80000	36.80000	82.00000	-0.66516	-7.6851	6.8554	-	-	-	*
		36.00000	36.80000	82.00000	-0.69993	-7.6249	6.8286	-	-	-	*
		37.20000	36.80000	82.00000	-0.86498	-5.6263	5.6797	-	-	-	*
		38.40000	36.80000	82.00000	-1.5172	-5.3378	5.5125	-	-	-	*
		39.60000	36.80000	82.00000	-2.0621	-4.9306	5.2607	-	-	-	*
		40.80000	36.80000	82.00000	-2.4722	-4.4489	4.9360	-	-	-	*
		42.00000	36.80000	82.00000	-2.7426	-3.9360	4.5518	-	-	-	*
		43.20000	36.80000	82.00000	-2.8844	-3.4268	4.1224	-	-	-	*
		44.40000	36.80000	82.00000	-2.9174	-2.9441	3.6633	-	-	-	*
		45.60000	36.80000	82.00000	-2.8637	-2.5007	3.1903	-	-	-	*
		46.80000	36.80000	82.00000	-2.7788	-2.1350	2.7397	-	-	-	*
		48.00000	36.80000	82.00000	-2.6831	-1.8386	2.3205	-	-	-	*
		49.20000	36.80000	82.00000	-2.5811	-1.5948	1.9196	-	-	-	*
		50.40000	36.80000	82.00000	-2.3805	-1.3660	1.5267	-	-	-	*
		51.60000	36.80000	82.00000	-2.0469	-1.1131	1.1312	-	-	-	*
		52.80000	36.80000	82.00000	-1.6812	-0.87538	0.75448	-	-	-	*
		54.00000	36.80000	82.00000	-1.2880	-0.65259	0.39065	-	-	-	*
		55.20000	36.80000	82.00000	-0.87144	-0.44406	0.13893	-	-	-	*
		56.40000	36.80000	82.00000	-0.67575	-0.32394	0.097033	-	-	-	*
		57.60000	36.80000	82.00000	-0.47390	-0.21395	0.071408	-	-	-	*
		58.80000	36.80000	82.00000	-0.26112	-0.11140	0.047164	-	-	-	*
		60.00000	36.80000	82.00000	-0.038952	-0.015750	0.011528	-	-	-	*
		0.00000	37.60000	82.00000	1.4110	-0.69517	0.26848	-	-	-	*
		1.20000	37.60000	82.00000	1.5819	-0.82782	0.35606	-	-	-	*
		2.40000	37.60000	82.00000	1.7366	-0.96904	0.46355	-	-	-	*
		3.60000	37.60000	82.00000	1.8726	-1.1198	0.66749	-	-	-	*
		4.80000	37.60000	82.00000	1.9867	-1.2781	1.0640	-	-	-	*
		6.00000	37.60000	82.00000	2.0754	-1.4456	1.4661	-	-	-	*
		7.20000	37.60000	82.00000	2.1344	-1.6209	1.8674	-	-	-	*
		8.40000	37.60000	82.00000	2.1592	-1.8023	2.2605	-	-	-	*
		9.60000	37.60000	82.00000	2.1574	-1.9991	2.6368	-	-	-	*
		10.80000	37.60000	82.00000	2.2317	-2.3237	3.0137	-	-	-	*
		12.00000	37.60000	82.00000	2.3188	-2.7553	3.4271	-	-	-	*
		13.20000	37.60000	82.00000	2.3325	-3.2272	3.8267	-	-	-	*
		14.40000	37.60000	82.00000	2.2540	-3.7320	4.2054	-	-	-	*
		15.60000	37.60000	82.00000	2.0641	-4.2546	4.5559	-	-	-	*
		16.80000	37.60000	82.00000	1.7475	-4.7703	4.8702	-	-	-	*
		18.00000	37.60000	82.00000	1.2983	-5.2453	5.1401	-	-	-	*
		19.20000	37.60000	82.00000	0.72593	-5.6399	5.3573	-	-	-	*
		20.40000	37.60000	82.00000	0.058573	-5.9159	5.5133	-	-	-	*
		21.60000	37.60000	82.00000	0.0	-8.4200	7.0247	-	-	-	*
		22.80000	37.60000	82.00000	0.0	-8.4200	7.0247	-	-	-	*
		24.00000	37.60000	82.00000	0.0	-8.4200	7.0247	-	-	-	*
		25.20000	37.60000	82.00000	0.0	-8.4200	7.0247	-	-	-	*
		26.40000	37.60000	82.00000	0.0	-8.4200	7.0247	-	-	-	*
		27.60000	37.60000	82.00000	-0.13650	-7.7233	6.5126	-	-	-	*
		28.80000	37.60000	82.00000	-0.26911	-7.6517	6.4819	-	-	-	*
		30.00000	37.60000	82.00000	-0.38169	-7.5714	6.4547	-	-	-	*
		31.20000	37.60000	82.00000	-0.47366	-7.4878	6.4293	-	-	-	*
		32.40000	37.60000	82.00000	-0.54645	-7.4054	6.4034	-	-	-	*
		33.60000	37.60000	82.00000	-0.60263	-7.3272	6.3749	-	-	-	*
		34.80000	37.60000	82.00000	-0.64516	-7.2550	6.3415	-	-	-	*
		36.00000	37.60000	82.00000	-0.67686	-7.1896	6.3019	-	-	-	*
		37.20000	37.60000	82.00000	-0.80897	-5.2779	5.2364	-	-	-	*
		38.40000	37.60000	82.00000	-1.3760	-5.0278	5.0834	-	-	-	*
		39.60000	37.60000	82.00000	-1.8567	-4.6744	4.8502	-	-	-	*
		40.80000	37.60000	82.00000	-2.2276	-4.2517	4.5475	-	-	-	*
		42.00000	37.60000	82.00000	-2.4814	-3.7941	4.1878	-	-	-	*
		43.20000	37.60000	82.00000	-2.6241	-3.3309	3.7851	-	-	-	*
		44.40000	37.60000	82.00000	-2.6692	-2.8834	3.3543	-	-	-	*
		45.60000	37.60000	82.00000	-2.6336	-2.4644	2.9111	-	-	-	*
		46.80000	37.60000	82.00000	-2.5335	-2.0806	2.4715	-	-	-	*
		48.00000	37.60000	82.00000	-2.4349	-1.7807	2.0751	-	-	-	*
		49.20000	37.60000	82.00000	-2.4092	-1.5993	1.7094	-	-	-	*
		50.40000	37.60000	82.00000	-2.1624	-1.3460	1.3325	-	-	-	*
		51.60000	37.60000	82.00000	-1.8469	-1.0918	0.96197	-	-	-	*
		52.80000	37.60000	82.00000	-1.4987	-0.85108	0.60574	-	-	-	*
		54.00000	37.60000	82.00000	-1.1223	-0.62391	0.25746	-	-	-	*
		55.20000	37.60000	82.00000	-0.76898	-0.42674	0.11707	-	-	-	*
		56.40000	37.60000	82.00000	-0.58906	-0.30667	0.086424	-	-	-	*
		57.60000	37.60000	82.00000	-0.39576	-0.19404	0.063328	-	-	-	*
		58.80000	37.60000	82.00000	-0.19092	-0.088452	0.037998	-	-	-	*
		60.00000	37.60000	82.00000	0.0	0.0	0.0	-	-	-	*
		0.00000	38.40000	82.00000	1.3044	-0.69357	0.23984	-	-	-	*
		1.20000	38.40000	82.00000	1.4658	-0.82785	0.31729	-	-	-	*
		2.40000	38.40000	82.00000	1.6106	-0.96990	0.41315	-	-	-	*
		3.60000	38.40000	82.00000	1.7361	-1.1198	0.52628	-	-	-	*
		4.80000	38.40000	82.00000	1.8396	-1.2772	0.87592	-	-	-	*
		6.00000	38.40000	82.00000	1.9177	-1.4416	1.2579	-	-	-	*
		7.20000	38.40000	82.00000	1.9665	-1.6117	1.6386	-	-	-	*
		8.40000	38.40000	82.00000	1.9822	-1.7856	2.0113	-	-	-	*
		9.60000	38.40000	82.00000	1.9602	-1.9602	2.3680	-	-	-	*
		10.80000	38.40000	82.00000	2.0354	-2.2872	2.7703	-	-	-	*
		12.00000	38.40000	82.00000	2.1052	-2.6995	3.1647	-	-	-	*
		13.20000	38.40000	82.00000	2.1052	-3.1434	3.5448	-	-	-	*
		14.40000	38.40000	82.00000	2.0204	-3.6103	3.9038	-	-	-	*
		15.60000	38.40000	82.00000	1.8366	-4.0854	4.2344	-	-	-	*
		16.80000	38.40000	82.00000	1.5435	-4.5469	4.5288	-	-	-	*
		18.00000	38.40000	82.00000	1.1391	-4.9666	4.7791	-	-	-	*
		19.20000	38.40000	82.00000	0.63360	-5.3125	4.9776	-	-	-	*
		20.40000	38.40000	82.00000	0.050965	-5.5552	5.1166	-	-	-	*
		21.60000	38.40000	82.00000	0.0	-7.9584	6.5291	-	-	-	*
		22.80000	38.40000	82.00000	0.0	-7.9584	6.5291	-	-	-	*
		24.00000	38.40000	82.00000	0.0	-7.9584	6.5291	-	-	-	*
		25.20000	38.40000	82.00000	0.0	-7.9584	6.5291	-	-	-	*
		26.40000	38.40000	82.00000	0.0	-7.9584	6.5291	-	-	-	*
		27.60000	38.40000	82.00000	-0.12692	-7.2660	6.0076	-	-	-	*
		28.80000	38.40000	82.00000	-0.25162	-7.2008	5.9758	-	-	-	*
		30.00000	38.40000	82.00000	-0.35934	-7.1274	5.9458	-	-	-	*
		31.20000	38.40000	82.00000	-0.44927	-7.0503	5.9162	-	-	-	*
		32.40000	38.40000	82.00000	-0.52224	-6.9732	5.8853	-	-	-	*
		33.60000	38.40000	82.00000	-0.58008	-6.8989	5.8512	-	-	-	*
		34.80000	38.40000	82.00000	-0.62510	-6.8293	5.8122	-	-	-	*
		36.00000	38.40000	82.00000	-0.65961	-6.7652	5.7672	-	-	-	*
		37.20000	38.40000	82.00000	-0.76357	-4.9395	4.7897	-	-	-	*
		38.40000	38.40000	82.00000	-1.2521	-4.7159	4.6441	-	-	-	*
		39.60000	38.40000	82.00000	-1.6758	-4.4075	4.4286	-	-	-	*
		40.80000	38.40000	82.00000	-2.0091	-4.0350	4.1475	-	-	-	*
		42.00000	38.40000	82.00000	-2.2440	-3.6262	3.8127	-	-	-	*
		43.20000	38.40000	82.00000	-2.3827	-3.2056	3.4375	-	-	-	*
		44.40000	38.40000	82.00000	-2.4345	-2.7921	3.0363	-	-	-	*
		45.60000	38.40000	82.00000	-2.4118	-2.3986	2.6242	-	-	-	*
		46.80000	38.40000	82.00000	-2.3278	-2.0323	2.2170	-	-	-	*
		48.00000	38.40000	82.00000	-2.2583	-1.7594	1.8328	-	-	-	*
		49.20000	38.40000	82.00000	-2.2098	-1.5725	1.4971	-	-	-	*
		50.40000	38.40000	82.00000	-1.9483	-1.3080	1.1377	-	-	-	*
		51.60000	38.40000	82.00000	-1.6492	-1.0542	0.79082	-	-	-	*
		52.80000	38.40000	82.00000	-1.3170	-0.81199	0.45379	-	-	-	*

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		54.00000	38.40000	82.00000	-0.95609	-0.58196	0.16814	-	-	- *
		55.20000	38.40000	82.00000	-0.67374	-0.40350	0.10231	-	-	- *
		56.40000	38.40000	82.00000	-0.50231	-0.28223	0.076548	-	-	- *
		57.60000	38.40000	82.00000	-0.31705	-0.16776	0.054823	-	-	- *
		58.80000	38.40000	82.00000	-0.11977	-0.059885	0.027081	-	-	- *
		60.00000	38.40000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	39.20000	82.00000	1.1982	-0.68385	0.21303	-	-	- *
		1.20000	39.20000	82.00000	1.3508	-0.81888	0.28071	-	-	- *
		2.40000	39.20000	82.00000	1.4864	-0.96084	0.36528	-	-	- *
		3.60000	39.20000	82.00000	1.6027	-1.1095	0.46591	-	-	- *
		4.80000	39.20000	82.00000	1.6968	-1.2645	0.68539	-	-	- *
		6.00000	39.20000	82.00000	1.7659	-1.4249	1.0475	-	-	- *
		7.20000	39.20000	82.00000	1.8064	-1.5891	1.4081	-	-	- *
		8.40000	39.20000	82.00000	1.8151	-1.7551	1.7607	-	-	- *
		9.60000	39.20000	82.00000	1.8439	-1.9792	2.1324	-	-	- *
		10.80000	39.20000	82.00000	1.8677	-2.2528	2.5152	-	-	- *
		12.00000	39.20000	82.00000	1.9009	-2.6165	2.8895	-	-	- *
		13.20000	39.20000	82.00000	1.8920	-3.0323	3.2494	-	-	- *
		14.40000	39.20000	82.00000	1.8056	-3.4633	3.5879	-	-	- *
		15.60000	39.20000	82.00000	1.6314	-3.8954	3.8981	-	-	- *
		16.80000	39.20000	82.00000	1.3628	-4.3095	4.1726	-	-	- *
		18.00000	39.20000	82.00000	1.0004	-4.6819	4.4039	-	-	- *
		19.20000	39.20000	82.00000	0.55412	-4.9871	4.5846	-	-	- *
		20.40000	39.20000	82.00000	0.044459	-5.2017	4.7081	-	-	- *
		21.60000	39.20000	82.00000	0.0	-7.5043	6.0162	-	-	- *
		22.80000	39.20000	82.00000	0.0	-7.5043	6.0162	-	-	- *
		24.00000	39.20000	82.00000	0.0	-7.5043	6.0162	-	-	- *
		25.20000	39.20000	82.00000	0.0	-7.5043	6.0162	-	-	- *
		26.40000	39.20000	82.00000	0.0	-7.5043	6.0162	-	-	- *
		27.60000	39.20000	82.00000	-0.11859	-6.8156	5.4913	-	-	- *
		28.80000	39.20000	82.00000	-0.23621	-6.7558	5.4589	-	-	- *
		30.00000	39.20000	82.00000	-0.33928	-6.6884	5.4267	-	-	- *
		31.20000	39.20000	82.00000	-0.42691	-6.6170	5.3936	-	-	- *
		32.40000	39.20000	82.00000	-0.49951	-6.5448	5.3583	-	-	- *
		33.60000	39.20000	82.00000	-0.55836	-6.4744	5.3193	-	-	- *
		34.80000	39.20000	82.00000	-0.60526	-6.4075	5.2755	-	-	- *
		36.00000	39.20000	82.00000	-0.64210	-6.3450	5.2258	-	-	- *
		37.20000	39.20000	82.00000	-0.73718	-4.6220	4.3539	-	-	- *
		38.40000	39.20000	82.00000	-1.1426	-4.4035	4.2004	-	-	- *
		39.60000	39.20000	82.00000	-1.5156	-4.1331	4.0017	-	-	- *
		40.80000	39.20000	82.00000	-1.8134	-3.8037	3.7419	-	-	- *
		42.00000	39.20000	82.00000	-2.0280	-3.4378	3.4321	-	-	- *
		43.20000	39.20000	82.00000	-2.1594	-3.0560	3.0847	-	-	- *
		44.40000	39.20000	82.00000	-2.2135	-2.6751	2.7138	-	-	- *
		45.60000	39.20000	82.00000	-2.1995	-2.3070	2.3339	-	-	- *
		46.80000	39.20000	82.00000	-2.1579	-1.9953	1.9603	-	-	- *
		48.00000	39.20000	82.00000	-2.1265	-1.7617	1.6086	-	-	- *
		49.20000	39.20000	82.00000	-1.9867	-1.5144	1.2770	-	-	- *
		50.40000	39.20000	82.00000	-1.7392	-1.2535	0.94342	-	-	- *
		51.60000	39.20000	82.00000	-1.4546	-1.0013	0.61869	-	-	- *
		52.80000	39.20000	82.00000	-1.1370	-0.75894	0.29916	-	-	- *
		54.00000	39.20000	82.00000	-0.79041	-0.52736	0.13642	-	-	- *
		55.20000	39.20000	82.00000	-0.57969	-0.37266	0.089247	-	-	- *
		56.40000	39.20000	82.00000	-0.41607	-0.25093	0.067143	-	-	- *
		57.60000	39.20000	82.00000	-0.23831	-0.13535	0.045424	-	-	- *
		58.80000	39.20000	82.00000	-0.048165	-0.025850	0.013742	-	-	- *
		60.00000	39.20000	82.00000	0.0	0.0	0.0	-	-	- *
		0.00000	40.00000	82.00000	1.0929	-0.66640	0.18831	-	-	- *
		1.20000	40.00000	82.00000	1.2374	-0.80143	0.24673	-	-	- *
		2.40000	40.00000	82.00000	1.3648	-0.94253	0.32047	-	-	- *
		3.60000	40.00000	82.00000	1.4728	-1.0893	0.40903	-	-	- *
		4.80000	40.00000	82.00000	1.5589	-1.2411	0.51061	-	-	- *
		6.00000	40.00000	82.00000	1.6203	-1.3968	0.83622	-	-	- *
		7.20000	40.00000	82.00000	1.6543	-1.5548	1.1771	-	-	- *
		8.40000	40.00000	82.00000	1.6814	-1.7369	1.5224	-	-	- *
		9.60000	40.00000	82.00000	1.7274	-1.9809	1.8884	-	-	- *
		10.80000	40.00000	82.00000	1.7425	-2.2455	2.2510	-	-	- *
		12.00000	40.00000	82.00000	1.7199	-2.5293	2.6048	-	-	- *
		13.20000	40.00000	82.00000	1.6926	-2.8983	2.9438	-	-	- *
		14.40000	40.00000	82.00000	1.6083	-3.2956	3.2616	-	-	- *
		15.60000	40.00000	82.00000	1.4461	-3.6889	3.5514	-	-	- *
		16.80000	40.00000	82.00000	1.2022	-4.0615	3.8062	-	-	- *
		18.00000	40.00000	82.00000	0.87868	-4.3934	4.0190	-	-	- *
		19.20000	40.00000	82.00000	0.48506	-4.6640	4.1831	-	-	- *
		20.40000	40.00000	82.00000	0.038838	-4.8548	4.2925	-	-	- *
		21.60000	40.00000	82.00000	0.0	-7.0569	5.4929	-	-	- *
		22.80000	40.00000	82.00000	0.0	-7.0569	5.4929	-	-	- *
		24.00000	40.00000	82.00000	0.0	-7.0569	5.4929	-	-	- *
		25.20000	40.00000	82.00000	0.0	-7.0569	5.4929	-	-	- *
		26.40000	40.00000	82.00000	0.0	-7.0569	5.4929	-	-	- *
		27.60000	40.00000	82.00000	-0.11128	-6.3715	4.9709	-	-	- *
		28.80000	40.00000	82.00000	-0.22253	-6.3163	4.9382	-	-	- *
		30.00000	40.00000	82.00000	-0.32120	-6.2541	4.9043	-	-	- *
		31.20000	40.00000	82.00000	-0.40639	-6.1878	4.8684	-	-	- *
		32.40000	40.00000	82.00000	-0.47822	-6.1201	4.8295	-	-	- *
		33.60000	40.00000	82.00000	-0.53759	-6.0534	4.7865	-	-	- *
		34.80000	40.00000	82.00000	-0.58585	-5.9893	4.7385	-	-	- *
		36.00000	40.00000	82.00000	-0.62457	-5.9287	4.6850	-	-	- *
		37.20000	40.00000	82.00000	-0.71197	-4.3082	3.9166	-	-	- *
		38.40000	40.00000	82.00000	-1.0594	-4.1064	3.7696	-	-	- *
		39.60000	40.00000	82.00000	-1.3726	-3.8534	3.5751	-	-	- *
		40.80000	40.00000	82.00000	-1.6373	-3.5612	3.3360	-	-	- *
		42.00000	40.00000	82.00000	-1.8311	-3.2331	3.0508	-	-	- *
		43.20000	40.00000	82.00000	-1.9528	-2.8865	2.7315	-	-	- *
		44.40000	40.00000	82.00000	-2.0059	-2.5360	2.3913	-	-	- *
		45.60000	40.00000	82.00000	-2.0156	-2.2197	2.0442	-	-	- *
		46.80000	40.00000	82.00000	-2.0238	-1.9782	1.7051	-	-	- *
		48.00000	40.00000	82.00000	-2.0000	-1.7526	1.3891	-	-	- *
		49.20000	40.00000	82.00000	-1.7816	-1.4511	1.0635	-	-	- *
		50.40000	40.00000	82.00000	-1.5358	-1.1840	0.75070	-	-	- *
		51.60000	40.00000	82.00000	-1.2640	-0.93421	0.44616	-	-	- *
		52.80000	40.00000	82.00000	-0.95959	-0.69282	0.17878	-	-	- *
		54.00000	40.00000	82.00000	-0.62759	-0.46146	0.10195	-	-	- *
		55.20000	40.00000	82.00000	-0.48731	-0.33469	0.077651	-	-	- *
		56.40000	40.00000	82.00000	-0.33081	-0.21315	0.057768	-	-	- *
		57.60000	40.00000	82.00000	-0.15999	-0.097082	0.034485	-	-	- *
		58.80000	40.00000	82.00000	0.0	0.0	0.0	-	-	- *
		60.00000	40.00000	82.00000	0.0	0.0	0.0	-	-	- *
Grid 2	Grid 2	20.00000	20.00000	82.00000	6.4443	6.4443	6.6364	-	-	- *
		20.00000	20.30000	82.00000	9.4574	3.7829	6.9075	-	-	- *
		20.00000	20.60000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	20.90000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	21.20000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	21.50000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	21.80000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	22.10000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	22.40000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	22.70000	82.00000	14.802	0.0	8.3146	-	-	- *
		20.00000	23.00000	82.00000	14.802	0.0	8.3146	-	-	- *
		21.70000	20.00000	82.00000	0.0	14.802	8.3146	-	-	- *
		21.70000	20.30000	82.00000	0.0	15.034	8.0999	-	-	- *
		21.70000	20.60000	82.00000	Point lies within an excavation.					*
		21.70000	20.90000	82.00000	Point lies within an excavation.					*
		21.70000	21.20000	82.00000	Point lies within an excavation.					*
		21.70000	21.50000	82.00000	Point lies within an excavation.					*
		21.70000	21.80000	82.00000	Point lies within an excavation.					*
		21.70000	22.10000	82.00000	Point lies within an excavation.					*
		21.70000	22.40000	82.00000	Point lies within an excavation.					*
		21.70000	22.70000	82.00000	Point lies within an excavation.					*
		21.70000	23.00000	82.00000	Point lies within an excavation.					*
		23.40000	20.00000	82.00000	0.0	14.802	8.3146	-	-	- *
		23.40000	20.30000	82.00000	0.0	15.034	8.0999	-	-	- *
		23.40000	20.60000	82.00000	Point lies within an excavation.					*
		23.40000	20.90000	82.00000	Point lies within an excavation.					*
		23.40000	21.20000	82.00000	Point lies within an excavation.					*
		23.40000	21.50000	82.00000	Point lies within an excavation.					*
		23.40000	21.80000	82.00000	Point lies within an excavation.					*
		23.40000	22.10000	82.00000	Point lies within an excavation.					*
		23.40000	22.40000	82.00000	Point lies within an excavation.					*
		23.40000	22.70000	82.00000	Point lies within an excavation.					*
		23.40000	23.00000	82.00000	Point lies within an excavation.					*

Type/No.		Coordinates			Displacements			Angle of Line		
Name	Dist.	x	y	z	x	y	z	Along the Line	Perpendicular to Line	x Axis
		25.10000	20.00000	82.00000	0.0	14.802	8.3146	-	-	- *
		25.10000	20.30000	82.00000	0.0	15.034	8.0999	-	-	- *
		25.10000	20.60000	82.00000		Point lies within an excavation.				*
		25.10000	20.90000	82.00000		Point lies within an excavation.				*
		25.10000	21.20000	82.00000		Point lies within an excavation.				*
		25.10000	21.50000	82.00000		Point lies within an excavation.				*
		25.10000	21.80000	82.00000		Point lies within an excavation.				*
		25.10000	22.10000	82.00000		Point lies within an excavation.				*
		25.10000	22.40000	82.00000		Point lies within an excavation.				*
		25.10000	22.70000	82.00000		Point lies within an excavation.				*
		25.10000	23.00000	82.00000		Point lies within an excavation.				*
		26.80000	20.00000	82.00000	-0.55483	13.777	8.0863	-	-	- *
		26.80000	20.30000	82.00000	-0.88057	13.671	7.8689	-	-	- *
		26.80000	20.60000	82.00000		Point lies within an excavation.				*
		26.80000	20.90000	82.00000		Point lies within an excavation.				*
		26.80000	21.20000	82.00000		Point lies within an excavation.				*
		26.80000	21.50000	82.00000		Point lies within an excavation.				*
		26.80000	21.80000	82.00000		Point lies within an excavation.				*
		26.80000	22.10000	82.00000		Point lies within an excavation.				*
		26.80000	22.40000	82.00000		Point lies within an excavation.				*
		26.80000	22.70000	82.00000		Point lies within an excavation.				*
		26.80000	23.00000	82.00000		Point lies within an excavation.				*
		28.50000	20.00000	82.00000	-1.1672	13.144	8.1745	-	-	- *
		28.50000	20.30000	82.00000	-1.2582	13.210	7.9815	-	-	- *
		28.50000	20.60000	82.00000		Point lies within an excavation.				*
		28.50000	20.90000	82.00000		Point lies within an excavation.				*
		28.50000	21.20000	82.00000		Point lies within an excavation.				*
		28.50000	21.50000	82.00000		Point lies within an excavation.				*
		28.50000	21.80000	82.00000		Point lies within an excavation.				*
		28.50000	22.10000	82.00000		Point lies within an excavation.				*
		28.50000	22.40000	82.00000		Point lies within an excavation.				*
		28.50000	22.70000	82.00000		Point lies within an excavation.				*
		28.50000	23.00000	82.00000		Point lies within an excavation.				*
		30.20000	20.00000	82.00000	-1.2385	13.020	8.3026	-	-	- *
		30.20000	20.30000	82.00000	-1.2818	13.153	8.1048	-	-	- *
		30.20000	20.60000	82.00000		Point lies within an excavation.				*
		30.20000	20.90000	82.00000		Point lies within an excavation.				*
		30.20000	21.20000	82.00000		Point lies within an excavation.				*
		30.20000	21.50000	82.00000		Point lies within an excavation.				*
		30.20000	21.80000	82.00000		Point lies within an excavation.				*
		30.20000	22.10000	82.00000		Point lies within an excavation.				*
		30.20000	22.40000	82.00000		Point lies within an excavation.				*
		30.20000	22.70000	82.00000		Point lies within an excavation.				*
		30.20000	23.00000	82.00000		Point lies within an excavation.				*
		31.90000	20.00000	82.00000	-1.2621	12.969	8.4482	-	-	- *
		31.90000	20.30000	82.00000	-1.2900	13.132	8.2493	-	-	- *
		31.90000	20.60000	82.00000		Point lies within an excavation.				*
		31.90000	20.90000	82.00000		Point lies within an excavation.				*
		31.90000	21.20000	82.00000		Point lies within an excavation.				*
		31.90000	21.50000	82.00000		Point lies within an excavation.				*
		31.90000	21.80000	82.00000		Point lies within an excavation.				*
		31.90000	22.10000	82.00000		Point lies within an excavation.				*
		31.90000	22.40000	82.00000		Point lies within an excavation.				*
		31.90000	22.70000	82.00000		Point lies within an excavation.				*
		31.90000	23.00000	82.00000		Point lies within an excavation.				*
		33.60000	20.00000	82.00000	-1.2737	16.607	13.463	-	-	- *
		33.60000	20.30000	82.00000	-1.2941	13.121	8.3889	-	-	- *
		33.60000	20.60000	82.00000		Point lies within an excavation.				*
		33.60000	20.90000	82.00000		Point lies within an excavation.				*
		33.60000	21.20000	82.00000		Point lies within an excavation.				*
		33.60000	21.50000	82.00000		Point lies within an excavation.				*
		33.60000	21.80000	82.00000		Point lies within an excavation.				*
		33.60000	22.10000	82.00000		Point lies within an excavation.				*
		33.60000	22.40000	82.00000		Point lies within an excavation.				*
		33.60000	22.70000	82.00000		Point lies within an excavation.				*
		33.60000	23.00000	82.00000		Point lies within an excavation.				*
		35.30000	20.00000	82.00000	-1.2805	12.925	8.7014	-	-	- *
		35.30000	20.30000	82.00000	-1.2966	13.114	8.5017	-	-	- *
		35.30000	20.60000	82.00000		Point lies within an excavation.				*
		35.30000	20.90000	82.00000		Point lies within an excavation.				*
		35.30000	21.20000	82.00000		Point lies within an excavation.				*
		35.30000	21.50000	82.00000		Point lies within an excavation.				*
		35.30000	21.80000	82.00000		Point lies within an excavation.				*
		35.30000	22.10000	82.00000		Point lies within an excavation.				*
		35.30000	22.40000	82.00000		Point lies within an excavation.				*
		35.30000	22.70000	82.00000		Point lies within an excavation.				*
		35.30000	23.00000	82.00000		Point lies within an excavation.				*
		37.00000	20.00000	82.00000	-1.2850	13.546	12.682	-	-	- *
		37.00000	20.30000	82.00000	-1.2982	10.040	7.7002	-	-	- *
		37.00000	20.60000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	20.90000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	21.20000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	21.50000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	21.80000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	22.10000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	22.40000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	22.70000	82.00000	-15.190	0.0	8.9087	-	-	- *
		37.00000	23.00000	82.00000	-15.190	0.0	8.9087	-	-	- *
Line 2	Line 2	25.00000	20.00000	82.00000	0.0	14.802	8.3146	-14.802	0.0	270.00 *
	1.0000	25.00000	19.00000	82.00000	0.0	14.046	8.8712	-14.046	0.0	270.00 *
	2.0000	25.00000	18.00000	82.00000	0.0	13.315	9.2048	-13.315	0.0	270.00 *
	3.0000	25.00000	17.00000	82.00000	0.0	12.607	9.3424	-12.607	0.0	270.00 *
	4.0000	25.00000	16.00000	82.00000	0.0	11.921	9.3095	-11.921	0.0	270.00 *
	5.0000	25.00000	15.00000	82.00000	0.0	11.255	9.1304	-11.255	0.0	270.00 *
	6.0000	25.00000	14.00000	82.00000	0.0	10.609	8.8275	-10.609	0.0	270.00 *
	7.0000	25.00000	13.00000	82.00000	0.0	9.9805	8.4220	-9.9805	0.0	270.00 *
	8.0000	25.00000	12.00000	82.00000	0.0	9.3685	7.9337	-9.3685	0.0	270.00 *
	9.0000	25.00000	11.00000	82.00000	0.0	8.7715	7.3806	-8.7715	0.0	270.00 *
	10.000	25.00000	10.00000	82.00000	0.0	8.1882	6.7795	-8.1882	0.0	270.00 *
Line 3	Line 3	33.00000	20.00000	82.00000	-1.2703	12.950	8.5408	-12.950	-1.2703	270.00 *
	1.0000	33.00000	19.00000	82.00000	-1.1798	12.368	9.0238	-12.368	-1.1798	270.00 *
	2.0000	33.00000	18.00000	82.00000	-1.0748	11.778	9.2584	-11.778	-1.0748	270.00 *
	3.0000	33.00000	17.00000	82.00000	-0.96677	11.177	9.2811	-11.177	-0.96677	270.00 *
	4.0000	33.00000	16.00000	82.00000	-0.86405	10.569	9.1251	-10.569	-0.86405	270.00 *
	5.0000	33.00000	15.00000	82.00000	-0.77109	9.9576	8.8209	-9.9576	-0.77109	270.00 *
	6.0000	33.00000	14.00000	82.00000	-0.68943	9.3484	8.3966	-9.3484	-0.68943	270.00 *
	7.0000	33.00000	13.00000	82.00000	-0.65827	8.7900	7.9225	-8.7900	-0.65827	270.00 *
	8.0000	33.00000	12.00000	82.00000	-0.62625	8.2374	7.3734	-8.2374	-0.62625	270.00 *
	9.0000	33.00000	11.00000	82.00000	-0.59474	7.6907	6.7700	-7.6907	-0.59474	270.00 *
	10.000	33.00000	10.00000	82.00000	-0.56454	7.1501	6.1307	-7.1501	-0.56454	270.00 *
Nthfld Swim Pool Sth	Line 4	31.80000	29.70000	83.65000	-1.0533	-12.019	9.1146	-0.91183	-12.030	359.33 *
	0.85006	32.65000	29.69000	83.65000	-1.0948	-11.979	9.1823	-0.95378	-11.991	359.33 *
	1.7001	33.50000	29.68000	83.65000	-1.1257	-11.947	9.2461	-0.98512	-11.959	359.33 *
	2.5502	34.35000	29.67000	83.65000	-1.1496	-11.921	9.3038	-1.0092	-11.934	359.33 *
	3.4002	35.20000	29.66000	83.65000	-1.1683	-11.901	9.3532	-1.0282	-11.914	359.33 *
	4.2503	36.05000	29.65000	83.65000	-1.1834	-11.884	9.3926	-1.0435	-11.897	359.33 *
	5.1004	36.90000	29.64000	83.65000	-1.1958	-11.871	9.4207	-1.0561	-11.885	359.33 *
	5.9504	37.75000	29.63000	83.65000	-3.8963	-7.8687	7.8150	-3.8035	-7.9140	359.33 *
	6.8005	38.60000	29.62000	83.65000	-5.6215	-6.0517	7.5309	-5.5499	-6.1174	359.33 *
	7.6505	39.45000	29.61000	83.65000	-6.4456	-4.6977	7.4049	-6.3899	-4.7732	359.33 *
	8.5006	40.30000	29.60000	83.65000	-6.9588	-3.8334	7.4135	-6.9132	-3.9150	359.33 *
Nthfld Swim Pool West	Line 5	31.80000	29.80000	83.65000	-1.0400	-11.960	9.1328	-11.983	0.74074	88.568 *
	0.80025	31.82000	30.60000	83.65000	-0.93643	-11.483	9.2050	-11.503	0.64915	88.568 *
	1.6005	31.84000	31.40000	83.65000	-0.84006	-10.993	9.1556	-11.011	0.56506	88.568 *
	2.4007	31.86000	32.20000	83.65000	-0.75387	-10.497	9.0004	-10.513	0.49130	88.568 *
	3.2010	31.88000	33.00000	83.65000	-0.68504	-10.006	8.7603	-10.019	0.43477	88.568 *
	4.0012	31.90000	33.80000	83.65000	-0.65561	-11.326	11.900	-11.339	0.37235	88.568 *
Nthfld Swim Pool East	Line 6	40.30000	29.70000	83.65000	-6.8219	-3.9269	7.3793	-4.1005	6.7190	88.531 *
	0.78026	40.32000	30.48000	83.65000	-5.8300	-4.4218	7.1065	-4.5698	5.7148	88.531 *
	1.5605	40.34000	31.26000	83.65000	-5.1157	-4.7745	6.9385	-4.9040	4.9916	88.531 *
	2.3408	40.36000	32.04000	83.65000	-4.5725	-5.0374	6.8117	-5.1530	4.4419	88.531 *
	3.1210	40.38000	32.82000	83.65000	-4.0852	-5.1492	6.6260	-5.2522	3.9519	88.531 *
	3.9013	40.40000	33.60000	83.65000	-3.6557	-5.1540	6.3886	-5.2460	3.5224	88.531 *
Nthfld Swim Pool	Line 7	31.90000	33.80000	83.65000	-0.65561	-11.326	11.900	-0.52233	-11.333	359.33 *

Type/No. Name	Dist.	Coordinates x	y	z	Displacements x	y	z	Angle of Line Along the Line	Perpendicular to x Axis to Line	
Nth										
	0.85006	32.75000	33.79000	83.65000	-0.68818	-9.4857	8.4834	-0.57654	-9.4931	359.33 *
	1.7001	33.60000	33.78000	83.65000	-0.74966	-9.4626	8.5282	-0.63829	-9.4708	359.33 *
	2.5502	34.45000	33.77000	83.65000	-0.80453	-9.4405	8.5697	-0.69342	-9.4493	359.33 *
	3.4002	35.30000	33.76000	83.65000	-0.85195	-9.4184	8.6043	-0.74110	-9.4278	359.33 *
	4.2503	36.15000	33.75000	83.65000	-0.89298	-9.3971	8.6310	-0.78238	-9.4070	359.33 *
	5.1004	37.00000	33.74000	83.65000	-0.92858	-7.0555	7.2034	-0.84551	-7.0659	359.33 *
	5.9504	37.85000	33.73000	83.65000	-1.8076	-6.7421	7.0596	-1.7281	-6.7629	359.33 *
	6.8005	38.70000	33.72000	83.65000	-2.5671	-6.2854	6.8666	-2.4929	-6.3152	359.33 *
	7.6505	39.55000	33.71000	83.65000	-3.1688	-5.7371	6.6302	-3.1011	-5.7740	359.33 *
	8.5006	40.40000	33.70000	83.65000	-3.6036	-5.1504	6.3557	-3.5427	-5.1924	359.33 *

* Result includes imported displacement(s).

Specific Building Damage Results - Horizontal Displacements

Structure: 57 Maresfield | Sub-structure: North Elevation

Dist.	Coordinates x	y	z	Displacements x	y	Along the Line	Perpendicular to Line	
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]	
0.0	20.50000	20.00000	82.00000	0.0	11.127	0.0	11.127	d
0.33000	20.83000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
0.66000	21.16000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
0.99000	21.49000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
1.3200	21.82000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
1.6500	22.15000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
1.9800	22.48000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
2.3100	22.81000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
2.6400	23.14000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
2.9700	23.47000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
3.3000	23.80000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
3.6300	24.13000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
3.9600	24.46000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
4.2900	24.79000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
4.6200	25.12000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
4.9500	25.45000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
5.2800	25.78000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
5.6100	26.11000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
5.9400	26.44000	20.00000	82.00000	0.0	14.802	0.0	14.802	d
6.2700	26.77000	20.00000	82.00000	-0.52148	13.818	-0.52148	13.818	d
6.6000	27.10000	20.00000	82.00000	-0.77841	13.501	-0.77841	13.501	d
6.9300	27.43000	20.00000	82.00000	-0.96735	13.372	-0.96735	13.372	d
7.2600	27.76000	20.00000	82.00000	-1.0662	13.275	-1.0662	13.275	d
7.5900	28.09000	20.00000	82.00000	-1.1237	13.206	-1.1237	13.206	d
7.9200	28.42000	20.00000	82.00000	-1.1603	13.154	-1.1603	13.154	d
8.2500	28.75000	20.00000	82.00000	-1.1853	13.116	-1.1853	13.116	d
8.5800	29.08000	20.00000	82.00000	-1.2033	13.085	-1.2033	13.085	d
8.9100	29.41000	20.00000	82.00000	-1.2168	13.061	-1.2168	13.061	d
9.2400	29.74000	20.00000	82.00000	-1.2273	13.042	-1.2273	13.042	d
9.5700	30.07000	20.00000	82.00000	-1.2357	13.025	-1.2357	13.025	d
9.9000	30.40000	20.00000	82.00000	-1.2425	13.012	-1.2425	13.012	d
10.230	30.73000	20.00000	82.00000	-1.2481	13.000	-1.2481	13.000	d
10.560	31.06000	20.00000	82.00000	-1.2529	12.990	-1.2529	12.990	d
10.890	31.39000	20.00000	82.00000	-1.2569	12.981	-1.2569	12.981	d
11.220	31.72000	20.00000	82.00000	-1.2604	12.973	-1.2604	12.973	d
11.550	32.05000	20.00000	82.00000	-1.2635	12.966	-1.2635	12.966	d
11.880	32.38000	20.00000	82.00000	-1.2661	12.960	-1.2661	12.960	d
12.210	32.71000	20.00000	82.00000	-1.2685	12.954	-1.2685	12.954	d
12.540	33.04000	20.00000	82.00000	-1.2706	12.949	-1.2706	12.949	d
12.870	33.37000	20.00000	82.00000	-1.2725	12.945	-1.2725	12.945	d
13.200	33.70000	20.00000	82.00000	-1.2742	12.941	-1.2742	12.941	d
13.530	34.03000	20.00000	82.00000	-1.2757	12.937	-1.2757	12.937	d
13.860	34.36000	20.00000	82.00000	-1.2771	12.933	-1.2771	12.933	d
14.190	34.69000	20.00000	82.00000	-1.2784	12.930	-1.2784	12.930	d
14.520	35.02000	20.00000	82.00000	-1.2796	12.927	-1.2796	12.927	d
14.850	35.35000	20.00000	82.00000	-1.2806	12.925	-1.2806	12.925	d
15.180	35.68000	20.00000	82.00000	-1.2816	12.922	-1.2816	12.922	d
15.510	36.01000	20.00000	82.00000	-1.2826	12.920	-1.2826	12.920	d
15.840	36.34000	20.00000	82.00000	-1.2834	12.917	-1.2834	12.917	d
16.170	36.67000	20.00000	82.00000	-1.2842	12.915	-1.2842	12.915	d
16.500	37.00000	20.00000	82.00000	-1.2850	13.546	-1.2850	13.546	d

d - Displacements include imported displacements.

Structure: 57 Maresfield | Sub-structure: West Wall

Dist.	Coordinates x	y	z	Displacements x	y	Along the Line	Perpendicular to Line	
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]	
0.0	25.00000	20.00000	82.00000	0.0	14.802	-14.802	0.0	d
1.0000	25.00000	19.00000	82.00000	0.0	14.046	-14.046	0.0	d
2.0000	25.00000	18.00000	82.00000	0.0	13.315	-13.315	0.0	d
3.0000	25.00000	17.00000	82.00000	0.0	12.607	-12.607	0.0	d
4.0000	25.00000	16.00000	82.00000	0.0	11.921	-11.921	0.0	d
5.0000	25.00000	15.00000	82.00000	0.0	11.255	-11.255	0.0	d
6.0000	25.00000	14.00000	82.00000	0.0	10.609	-10.609	0.0	d
7.0000	25.00000	13.00000	82.00000	0.0	9.9805	-9.9805	0.0	d
8.0000	25.00000	12.00000	82.00000	0.0	9.3685	-9.3685	0.0	d
9.0000	25.00000	11.00000	82.00000	0.0	8.7715	-8.7715	0.0	d
10.000	25.00000	10.00000	82.00000	0.0	8.1882	-8.1882	0.0	d

d - Displacements include imported displacements.

Structure: 57 Maresfield | Sub-structure: East Wall

Dist.	Coordinates x	y	z	Displacements x	y	Along the Line	Perpendicular to Line	
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]	
0.0	33.00000	20.00000	82.00000	-1.2703	12.950	-12.950	-1.2703	d
1.0000	33.00000	19.00000	82.00000	-1.1798	12.368	-12.368	-1.1798	d
2.0000	33.00000	18.00000	82.00000	-1.0748	11.778	-11.778	-1.0748	d
3.0000	33.00000	17.00000	82.00000	-0.96677	11.177	-11.177	-0.96677	d
4.0000	33.00000	16.00000	82.00000	-0.86405	10.569	-10.569	-0.86405	d
5.0000	33.00000	15.00000	82.00000	-0.77109	9.9576	-9.9576	-0.77109	d
6.0000	33.00000	14.00000	82.00000	-0.68943	9.3484	-9.3484	-0.68943	d
7.0000	33.00000	13.00000	82.00000	-0.65827	8.7900	-8.7900	-0.65827	d
8.0000	33.00000	12.00000	82.00000	-0.62625	8.2374	-8.2374	-0.62625	d
9.0000	33.00000	11.00000	82.00000	-0.59474	7.6907	-7.6907	-0.59474	d
10.000	33.00000	10.00000	82.00000	-0.56454	7.1501	-7.1501	-0.56454	d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: South Wall

Dist.	Coordinates x	y	z	Displacements x	y	Along the Line	Perpendicular to Line	
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]	
0.0	31.80000	29.70000	83.65000	-1.0533	-12.019	-0.91183	-12.030	d
0.85006	32.65000	29.69000	83.65000	-1.0948	-11.979	-0.95378	-11.991	d
1.7001	33.50000	29.68000	83.65000	-1.1257	-11.947	-0.98512	-11.959	d
2.5502	34.35000	29.67000	83.65000	-1.1496	-11.921	-1.0092	-11.934	d
3.4002	35.20000	29.66000	83.65000	-1.1683	-11.901	-1.0282	-11.914	d
4.2503	36.05000	29.65000	83.65000	-1.1834	-11.884	-1.0435	-11.897	d
5.1004	36.90000	29.64000	83.65000	-1.1958	-11.871	-1.0561	-11.885	d
5.9504	37.75000	29.63000	83.65000	-3.8963	-7.8687	-3.8035	-7.9140	d
6.8005	38.60000	29.62000	83.65000	-5.6215	-6.0517	-5.5499	-6.1174	d
7.6505	39.45000	29.61000	83.65000	-6.4456	-4.6977	-6.3899	-4.7732	d
8.5006	40.30000	29.60000	83.65000	-6.9588	-3.8334	-6.9132	-3.9150	d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: West Wall

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Along the Line	Perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	31.80000	29.80000	83.65000	-1.0400	-11.960	-11.983	0.74074 d
0.80025	31.82000	30.60000	83.65000	-0.93643	-11.483	-11.503	0.64915 d
1.6005	31.84000	31.40000	83.65000	-0.84006	-10.993	-11.011	0.56506 d
2.4007	31.86000	32.20000	83.65000	-0.75387	-10.497	-10.513	0.49130 d
3.2010	31.88000	33.00000	83.65000	-0.68504	-10.006	-10.019	0.43477 d
4.0012	31.90000	33.80000	83.65000	-0.65561	-11.326	-11.339	0.37235 d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: East Wall

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Along the Line	Perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	40.30000	29.70000	83.65000	-6.8219	-3.9269	-4.1005	6.7190 d
0.78026	40.32000	30.48000	83.65000	-5.8300	-4.4218	-4.5698	5.7148 d
1.5605	40.34000	31.26000	83.65000	-5.1157	-4.7745	-4.9040	4.9916 d
2.3408	40.36000	32.04000	83.65000	-4.5725	-5.0374	-5.1530	4.4419 d
3.1210	40.38000	32.82000	83.65000	-4.0852	-5.1492	-5.2522	3.9519 d
3.9013	40.40000	33.60000	83.65000	-3.6557	-5.1540	-5.2460	3.5224 d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: North Wall

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Along the Line	Perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	31.90000	33.80000	83.65000	-0.65561	-11.326	-0.52233	-11.333 d
0.85006	32.75000	33.79000	83.65000	-0.68818	-9.4857	-0.57654	-9.4931 d
1.7001	33.60000	33.78000	83.65000	-0.74966	-9.4626	-0.63829	-9.4708 d
2.5502	34.45000	33.77000	83.65000	-0.80453	-9.4405	-0.69342	-9.4493 d
3.4002	35.30000	33.76000	83.65000	-0.85195	-9.4184	-0.74110	-9.4278 d
4.2503	36.15000	33.75000	83.65000	-0.89298	-9.3971	-0.78238	-9.4070 d
5.1004	37.00000	33.74000	83.65000	-0.92858	-7.0555	-0.84551	-7.0659 d
5.9504	37.85000	33.73000	83.65000	-1.8076	-6.7421	-1.7281	-6.7629 d
6.8005	38.70000	33.72000	83.65000	-2.5671	-6.2854	-2.4929	-6.3152 d
7.6505	39.55000	33.71000	83.65000	-3.1688	-5.7371	-3.1011	-5.7740 d
8.5006	40.40000	33.70000	83.65000	-3.6036	-5.1504	-3.5427	-5.1924 d

d - Displacements include imported displacements.

Specific Building Damage Results - Vertical Displacements

Structure: 57 Maresfield | Sub-structure: North Elevation

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]

Vertical Offset 1

0.0	20.50000	20.00000	82.00000	7.1795 d
0.33000	20.83000	20.00000	82.00000	8.3146 d
0.66000	21.16000	20.00000	82.00000	8.3146 d
0.99000	21.49000	20.00000	82.00000	8.3146 d
1.3200	21.82000	20.00000	82.00000	8.3146 d
1.6500	22.15000	20.00000	82.00000	8.3146 d
1.9800	22.48000	20.00000	82.00000	8.3146 d
2.3100	22.81000	20.00000	82.00000	8.3146 d
2.6400	23.14000	20.00000	82.00000	8.3146 d
2.9700	23.47000	20.00000	82.00000	8.3146 d
3.3000	23.80000	20.00000	82.00000	8.3146 d
3.6300	24.13000	20.00000	82.00000	8.3146 d
3.9600	24.46000	20.00000	82.00000	8.3146 d
4.2900	24.79000	20.00000	82.00000	8.3146 d
4.6200	25.12000	20.00000	82.00000	8.3146 d
4.9500	25.45000	20.00000	82.00000	8.3146 d
5.2800	25.78000	20.00000	82.00000	8.3146 d
5.6100	26.11000	20.00000	82.00000	8.3146 d
5.9400	26.44000	20.00000	82.00000	8.3146 d
6.2700	26.77000	20.00000	82.00000	8.0911 d
6.6000	27.10000	20.00000	82.00000	8.0726 d
6.9300	27.43000	20.00000	82.00000	8.1024 d
7.2600	27.76000	20.00000	82.00000	8.1259 d
7.5900	28.09000	20.00000	82.00000	8.1475 d
7.9200	28.42000	20.00000	82.00000	8.1691 d
8.2500	28.75000	20.00000	82.00000	8.1916 d
8.5800	29.08000	20.00000	82.00000	8.2151 d
8.9100	29.41000	20.00000	82.00000	8.2397 d
9.2400	29.74000	20.00000	82.00000	8.2653 d
9.5700	30.07000	20.00000	82.00000	8.2919 d
9.9000	30.40000	20.00000	82.00000	8.3192 d
10.230	30.73000	20.00000	82.00000	8.3471 d
10.560	31.06000	20.00000	82.00000	8.3755 d
10.890	31.39000	20.00000	82.00000	8.4040 d
11.220	31.72000	20.00000	82.00000	8.4326 d
11.550	32.05000	20.00000	82.00000	8.4611 d
11.880	32.38000	20.00000	82.00000	8.4893 d
12.210	32.71000	20.00000	82.00000	8.5170 d
12.540	33.04000	20.00000	82.00000	8.5441 d
12.870	33.37000	20.00000	82.00000	8.5704 d
13.200	33.70000	20.00000	82.00000	8.5958 d
13.530	34.03000	20.00000	82.00000	8.6201 d
13.860	34.36000	20.00000	82.00000	8.6432 d
14.190	34.69000	20.00000	82.00000	8.6650 d
14.520	35.02000	20.00000	82.00000	8.6853 d
14.850	35.35000	20.00000	82.00000	8.7042 d
15.180	35.68000	20.00000	82.00000	8.7214 d
15.510	36.01000	20.00000	82.00000	8.7369 d
15.840	36.34000	20.00000	82.00000	8.7506 d
16.170	36.67000	20.00000	82.00000	8.7624 d
16.500	37.00000	20.00000	82.00000	12.682 d

d - Displacements include imported displacements.

Structure: 57 Maresfield | Sub-structure: West Wall

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]

Vertical Offset 1

0.0	25.00000	20.00000	82.00000	8.3146 d
1.0000	25.00000	19.00000	82.00000	8.8712 d
2.0000	25.00000	18.00000	82.00000	9.2048 d
3.0000	25.00000	17.00000	82.00000	9.3424 d
4.0000	25.00000	16.00000	82.00000	9.3095 d
5.0000	25.00000	15.00000	82.00000	9.1304 d
6.0000	25.00000	14.00000	82.00000	8.8275 d
7.0000	25.00000	13.00000	82.00000	8.4220 d
8.0000	25.00000	12.00000	82.00000	7.9337 d
9.0000	25.00000	11.00000	82.00000	7.3806 d
10.000	25.00000	10.00000	82.00000	6.7795 d

d - Displacements include imported displacements.

Structure: 57 Maresfield | Sub-structure: East Wall

Dist.	Coordinates			Displacements

	x	y	z	z
[m]	[m]	[m]	[m]	[mm]	

Vertical Offset 1

0.0 33.00000 20.00000 82.00000 8.5408 d
1.0000 33.00000 19.00000 82.00000 9.0238 d
2.0000 33.00000 18.00000 82.00000 9.2584 d
3.0000 33.00000 17.00000 82.00000 9.2811 d
4.0000 33.00000 16.00000 82.00000 9.1251 d
5.0000 33.00000 15.00000 82.00000 8.8209 d
6.0000 33.00000 14.00000 82.00000 8.3966 d
7.0000 33.00000 13.00000 82.00000 7.9225 d
8.0000 33.00000 12.00000 82.00000 7.3734 d
9.0000 33.00000 11.00000 82.00000 6.7700 d
10.000 33.00000 10.00000 82.00000 6.1307 d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: South Wall

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]

Vertical Offset 1

0.0 31.80000 29.70000 83.65000 9.1146 d
0.85006 32.65000 29.69000 83.65000 9.1823 d
1.7001 33.50000 29.68000 83.65000 9.2461 d
2.5502 34.35000 29.67000 83.65000 9.3038 d
3.4002 35.20000 29.66000 83.65000 9.3532 d
4.2503 36.05000 29.65000 83.65000 9.3926 d
5.1004 36.90000 29.64000 83.65000 9.4207 d
5.9504 37.75000 29.63000 83.65000 7.8150 d
6.8005 38.60000 29.62000 83.65000 7.5309 d
7.6505 39.45000 29.61000 83.65000 7.4049 d
8.5006 40.30000 29.60000 83.65000 7.4135 d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: West Wall

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]

Vertical Offset 1

0.0 31.80000 29.80000 83.65000 9.1328 d
0.80025 31.82000 30.60000 83.65000 9.2050 d
1.6005 31.84000 31.40000 83.65000 9.1556 d
2.4007 31.86000 32.20000 83.65000 9.0004 d
3.2010 31.88000 33.00000 83.65000 8.7603 d
4.0012 31.90000 33.80000 83.65000 11.900 d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: East Wall

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]

Vertical Offset 1

0.0 40.30000 29.70000 83.65000 7.3793 d
0.78026 40.32000 30.48000 83.65000 7.1065 d
1.5605 40.34000 31.26000 83.65000 6.9385 d
2.3408 40.36000 32.04000 83.65000 6.8117 d
3.1210 40.38000 32.82000 83.65000 6.6260 d
3.9013 40.40000 33.60000 83.65000 6.3886 d

d - Displacements include imported displacements.

Structure: Netherfield Swimming Pool | Sub-structure: North Wall

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]

Vertical Offset 1

0.0 31.90000 33.80000 83.65000 11.900 d
0.85006 32.75000 33.79000 83.65000 8.4834 d
1.7001 33.60000 33.78000 83.65000 8.5282 d
2.5502 34.45000 33.77000 83.65000 8.5697 d
3.4002 35.30000 33.76000 83.65000 8.6043 d
4.2503 36.15000 33.75000 83.65000 8.6310 d
5.1004 37.00000 33.74000 83.65000 7.2034 d
5.9504 37.85000 33.73000 83.65000 7.0596 d
6.8005 38.70000 33.72000 83.65000 6.8666 d
7.6505 39.55000 33.71000 83.65000 6.6302 d
8.5006 40.40000 33.70000 83.65000 6.3557 d

d - Displacements include imported displacements.

Specific Building Damage Results - All Segments

Structure: 57 Maresfield | Sub-structure: North Elevation

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0	1	0.0	0.78000	Sagging	0.0	0.0	0.0	0.0	0.0	-	0 (Negligible)
	2	0.78000	0.82739	Sagging	0.010932	-0.031970	0.0092808	0.0015828	678.13E-6	1798.6	0 (Negligible)
	3	1.6074	1.0775	Hogging	0.0090941	-0.072313	0.015404	0.0015828	678.13E-6	1474.8	0 (Negligible)
	4	2.6849	0.49431	Sagging	70.532E-6	-0.018182	0.0036367	299.57E-6	-71.042E-6	43850.	0 (Negligible)
	5	3.1792	3.3018	Hogging	310.31E-6	-0.0037661	774.16E-6	110.98E-6	-86.705E-6	100900.	0 (Negligible)
	6	6.4810	2.0190	Sagging	125.97E-6	-754.75E-6	167.76E-6	10.565E-6	-86.705E-6	77292.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: 57 Maresfield | Sub-structure: West Wall

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0	1	0.0	8.9000	Sagging	0.015386	0.066911	0.084422	-755.55E-6	-556.20E-6	4105.4	2 (Slight)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: 57 Maresfield | Sub-structure: East Wall

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	

Vertical Offset from Line for Vertical Movement	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement	Maximum Gradient of Vertical Displacement	Min. Radius of Curvature	Damage Category
0	1	0.0	8.9000	Sagging	0.014952	0.058439	0.075455	-610.81E-6	603.13E-6	3666.3	2 (Slight)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Netherfield Swimming Pool | Sub-structure: South Wall

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0	1	0.0	5.5320	Sagging	0.016853	-0.033580	0.0075041	0.0032426	0.0018951	1479.9	0 (Negligible)
	2	5.5320	2.7680	Hogging	0.017571	-0.14729	0.030832	0.0032426	0.0018951	1622.3	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Netherfield Swimming Pool | Sub-structure: West Wall

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0	1	0.0	1.5852	Sagging	0.0040416	0.060850	0.065094	-622.22E-6	193.85E-6	4737.6	1 (Very Slight)
	2	1.5852	2.1148	Hogging	0.084769	-0.0023076	0.078189	0.0016511	-0.0039302	135.70	2 (Slight)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Netherfield Swimming Pool | Sub-structure: East Wall

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0	1	0.0	1.8567	Hogging	0.0035069	-0.046848	0.0095654	601.84E-6	349.85E-6	4735.0	0 (Negligible)
	2	1.8567	1.8433	Sagging	0.0021162	-0.011740	0.0025593	319.15E-6	304.26E-6	10850.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Netherfield Swimming Pool | Sub-structure: North Wall

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]			[m]	
0	1	0.0	2.4444	Hogging	0.085790	-0.0067230	0.075708	72.652E-6	0.0040198	159.11	2 (Slight)
	2	2.4444	2.2201	Sagging	0.030506	-0.0057442	0.033846	74.280E-6	0.0016795	1771.0	0 (Negligible)
	3	4.6646	1.9221	Hogging	0.021198	-0.081680	0.020265	0.0010394	0.0016795	2530.0	0 (Negligible)
	4	6.5867	1.7133	Sagging	0.0012442	-0.064198	0.012854	900.51E-6	323.16E-6	16372.	0 (Negligible)

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Specific Building Damage Results - Critical Values for All Segments within Each Sub-Structure

Structure: 57 Maresfield | Sub-structure: North Elevation

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature (Hogging)	Min. Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0	0.010932	-0.072313	678.13E-6	8.5804	0.015404	0.0015828	678.13E-6	1474.8	1798.6	0 (Negligible)

Structure: 57 Maresfield | Sub-structure: West Wall

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature (Hogging)	Min. Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0	0.015386	0.066911	-556.20E-6	9.3402	0.084422	-755.55E-6	-556.20E-6	-	4105.4	2 (Slight)

Structure: 57 Maresfield | Sub-structure: East Wall

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature (Hogging)	Min. Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0	0.014952	0.058439	603.13E-6	9.2806	0.075455	-610.81E-6	603.13E-6	-	3666.3	2 (Slight)

Structure: Netherfield Swimming Pool | Sub-structure: South Wall

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature (Hogging)	Min. Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0	0.017571	-0.14729	0.0018951	9.4198	0.030832	0.0032426	0.0018951	1622.3	1479.9	0 (Negligible)

Structure: Netherfield Swimming Pool | Sub-structure: West Wall

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature (Hogging)	Min. Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0	0.084769	0.060850	-0.0039302	11.111	0.078189	0.0016511	-0.0039302	135.70	4737.6	2 (Slight)

Structure: Netherfield Swimming Pool | Sub-structure: East Wall

Vertical Offset from Line for	Deflection Ratio	Average Horizontal Strain	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Maximum Gradient of Horizontal	Maximum Gradient of Vertical	Min. Radius of Curvature	Min. Radius of Curvature	Damage Category

Vertical Movement Calculations				Displacement Curve	Displacement (Hogging)	(Sagging)		
[m]	[%]	[%]	[mm]	[%]			[m]	[m]
0	0.0035069	-0.046848	349.85E-6	7.3444	0.0095654	601.84E-6	349.85E-6	4735.0	10850. 0 (Negligible)

Structure: Netherfield Swimming Pool | Sub-structure: North Wall

Vertical Offset from Line for Vertical Movement Calculations	Deflection Ratio	Average Horizontal Strain	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature (Hogging)	Min. Radius of Curvature (Sagging)	Damage Category
[m]	[%]	[%]		[mm]	[%]			[m]	[m]	
0	0.085790	-0.081680	0.0040198	11.498	0.075708	0.0010394	0.0040198	159.11	1771.0	2 (Slight)

Specific Building Damage Results - Critical Segments within Each Structure

Structure Name	Parameter	Critical Sub-Structure	Critical Segment	Start	End	Curvature	Maximum Slope	Maximum Settlement	Max. Tensile Strain	Min. Radius of Curvature (Hogging)	Min. Radius of Curvature (Sagging)	Damage Category
				[m]	[m]			[mm]	[%]	[m]	[m]	
57 Maresfield	Maximum Slope	North Elevation	2	0.78000	1.6074	Sagging	**678.13E-6**	8.3146	0.0092808	-	1798.6	0 (Negligible)
	Maximum Settlement	West Wall	1	0.0	8.9000	Sagging	556.20E-6	**9.3402**	0.084422	-	4105.4	2 (Slight)
	Max. Tensile Strain	West Wall	1	0.0	8.9000	Sagging	556.20E-6	9.3402	**0.084422**	-	4105.4	2 (Slight)
	Min. Radius of Curvature (Hogging)	North Elevation	3	1.6074	2.6849	Hogging	678.13E-6	8.2012	0.015404	**1474.8**	-	0 (Negligible)
	Min. Radius of Curvature (Sagging)	North Elevation	2	0.78000	1.6074	Sagging	678.13E-6	8.3146	0.0092808	-	**1798.6**	0 (Negligible)
Netherfield Swimming Pool	Maximum Slope	North Wall	1	0.0	2.4444	Hogging	**0.0040198**	11.498	0.075708	159.11	-	2 (Slight)
	Maximum Settlement	North Wall	1	0.0	2.4444	Hogging	0.0040198	**11.498**	0.075708	159.11	-	2 (Slight)
	Max. Tensile Strain	West Wall	2	1.5852	3.7000	Hogging	0.0039302	11.111	**0.078189**	135.70	-	2 (Slight)
	Min. Radius of Curvature (Hogging)	West Wall	2	1.5852	3.7000	Hogging	0.0039302	11.111	0.078189	**135.70**	-	2 (Slight)
	Min. Radius of Curvature (Sagging)	South Wall	1	0.0	5.5320	Sagging	0.0018951	9.4198	0.0075041	-	**1479.9**	0 (Negligible)

Specific Building Damage Results - All Combined Segments

Structure: 57 Maresfield | Sub-structure: North Elevation

Vertical Offset from Line for Vertical Movement Calculations	Combined Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]	

No structures have segments combined.

Structure: 57 Maresfield | Sub-structure: West Wall

Vertical Offset from Line for Vertical Movement Calculations	Combined Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]	

No structures have segments combined.

Structure: 57 Maresfield | Sub-structure: East Wall

Vertical Offset from Line for Vertical Movement Calculations	Combined Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]	

No structures have segments combined.

Structure: Netherfield Swimming Pool | Sub-structure: South Wall

Vertical Offset from Line for Vertical Movement Calculations	Combined Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]	

No structures have segments combined.

Structure: Netherfield Swimming Pool | Sub-structure: West Wall

Vertical Offset from Line for Vertical Movement Calculations	Combined Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]	

No structures have segments combined.

Structure: Netherfield Swimming Pool | Sub-structure: East Wall

Vertical Offset from Line for Vertical Movement Calculations	Combined Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]	

No structures have segments combined.

Structure: Netherfield Swimming Pool | Sub-structure: North Wall

Vertical Offset from Line for Vertical Movement Calculations	Combined Segment	Start	Length	Curvature	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]		[%]	[%]	[%]	

No structures have segments combined.

Vertical Offset from Line for Vertical	Combined Segment	Start	Length	Curvature Ratio	Deflection Ratio	Average Horizontal Strain	Max. Tensile Strain	Damage Category

Geotechnical & Environmental Associates (GEA)
is an engineer-led and client-focused independent specialist providing a complete range of geotechnical and contaminated land investigation, analytical and consultancy services to the property and construction industries.

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