

CARLINE ROAD EMBANKMENT STABILISATION

Project: Contiguous piled retaining walls to prevent embankment slippage.

Location: Lincoln

Client: Manorcrest Homes Ltd.

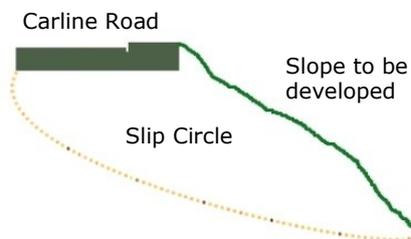
Project Engineers: Ward Cole Consulting Engineers

Geotechnical Consultants: Raison Foster Associates

Project Overview

In 2008 we were contacted by Manorcrest Homes Ltd. regarding a site in a prime location of Lincoln which many a developer had shied away from previously. As one of the UK's largest and most experienced geotechnical engineering contractors, they required our input, and value engineering suggestions, as to how they may cost effectively stabilise the road and embankment allowing them to develop this land.

Having looked at the drawings and considered the difficulties in carrying out such a project, the suggestion was made, to our client, to employ the services of one of the UK's most experienced geotechnical design consultants, also based within our region; Raison Foster Associates. Over the next two years Ward Cole Consulting Engineers of Lincoln, Raison Foster, Manor Crest and Van Elle formulated a plan to install a number of contiguous piled retaining walls forming steps on which to build the development. Ward Cole had already produced the site plan, individual plot diagrams and indicative pile layouts on which to base this proposed way forward.



The site is located to the north west of Lincoln city centre on steeply sloping ground. Carline road, as shown in the diagram opposite, runs along the northern boundary at a level of +55m and the ground drops away at an average slope of 15°. The southern boundary is marked by a hedgerow and is at a level of approx. +47m. Beyond are gardens of properties located further down the hill. To the east on Carline Road is the driveway of a modern house.

There was significant evidence in the structure of the old property to the west of Carline Road, the road itself and existing retaining walls that current loads were too much for the slip circle and this would have to be factored into any additional development's design.

The general arrangement details the 4 proposed blocks be built over a number of levels roughly following the slope.

Our works were carried out over 3 phases detailed below in the construction sequence.



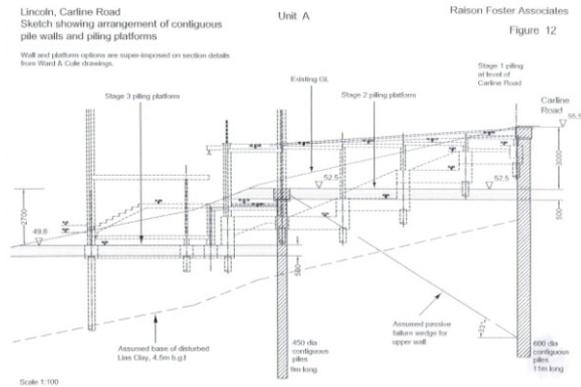
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Construction Sequence

1) Installation of a contiguous piled retaining wall with capping beam at the top of the site, adjacent to Carline Road's pavement. Piles were installed from road level.

- a. Carried out a reduced level dig to provide a suitable working platform. Excavation 0.5m below platform level to install the piling matt, designed by Van Elle Ltd.



Block	Approx commencing level (m)	Wall height (m)	Pile dia./spacing (m)	Pile length (m)	Pile Number
A	55.5	3.0	600/750	11.0	42
B	55.5	3.0	600/750	11.0	26
C	55.5	3.0	600/750	11.0	20
D	55.0	2.5	450/600	10.0	37

2) Installation of a secondary contiguous piled retaining wall, the top of which is 3m below the top of the original wall.

- a. Carried out a reduced level dig to provide a suitable working platform. Temporary excavation 0.5m below platform level to allow the placement of an adequate piling matt, again designed by Van Elle Ltd.

Block	Approx commencing level (m)	Wall height (m)	Pile dia./spacing (m)	Pile length (m)	Pile Number
A	52.5	2.7	450/600	9.0	62
B	52.5	3.8	600/750	12.5	28
C	52.5	1.3	450/600	9.0	25
D	52.5	1.8	450/600	8.0	41

3) The installation of stabilising piles at the lower part of the site to minimise the risk of slippage of the garden.

Approx commencing level (m)	Pile dia./spacing (m)	Pile length (m)	Pile Number
47.5 - 48.5	300/900	9.0	17



We also installed 30No. 450mm diameter, 9m deep piles adjacent to the driveway of the house to the east of Carline road. This was to retain the driveway and property when the steps were excavated.

The upper retaining wall piles were installed by a 12.5t Klemm 709 due to the instability of the slope, however the second retaining wall and stabilising piles were installed by the larger 16.1t Soiltec rig as it was quicker and more powerful.

Stepped contiguous piled retaining wall below Carline Road.

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Having installed the walls, the building itself needed to be supported and using the structural loads and site investigation report, detailing water content, ground type, sulphate class, engineers specification etc., we designed the bearing piles.

Across the 4 blocks, we installed a total of 117 No. 300/350mm diameter bearing piles between 9m & 11m in depth.

Result

Working for a local developer and in partnership with both local structural engineers, Ward Cole, and local geotechnical consultants, Raison Foster, we were able to overcome a complex issue which had put off potential developers of this prime site for more than 10 years.



2nd level piled retaining wall



Proposed development from lower slope

Thanks to the innovation, value engineering and modern design ability of some of our region's best engineers, this previously overgrown and evaded site has become one of Lincoln's most desirable places to live.

The geotechnical element was completed ahead of schedule and our client, Manorcrest was extremely pleased with the result, the cost and the solution the project team had proposed. The value of this project to Van Elle Ltd was £261,155.00



Installing steel at the base of the retaining wall

Carline Road project overlooking the city of Lincoln

