

M74 Glasgow—Ground Improvement by Compaction Grouting

Project Profile

Client: Glasgow City Council/
Transport Scotland

Main Contractor: Interlink M74
JV

Value: £570k



This scheme was carried out on behalf of the Interlink M74 JV (Balfour Beatty, Morgan Sindall, Sir Alfred McAlpine and Morrison Construction) as part of their ongoing maintenance obligations to the M74 Extension Project. Following completion of the road in 2010 several resurfacing exercises had been required at this gantry location due to settlement of the carriageway surface.

In an attempt to find a permanent solution, Forkers Scotland were invited to join Interlink and their Designers Atkins/Jacobs to develop a technical solution to eliminate any future settlement. A compaction grouting technique was adopted as the preferred solution. Compaction grouting aims to densify the host (weak) material by injecting controlled volumes of stiff mortar grout in ascending stages using 'end of casing' drilling and grouting methods on a predetermined grid pattern.

The injection of grout at low pressure on a prescribed grid and through the vertical extent of the weak material provides key ground improvement benefits;

- Densifying the host material by it being compacted through the introduction of a connected series/columns of 'bulbs' of mortar grout
- The bulbs of grout also provide a grid of grouted 'inclusions' in the host material which act as stronger columns within the weaker material

A 2 metre square primary treatment grid was formed and grout injected to limiting pressures in ascending stages from up to 12m BGL to the surface. Dependent on the grout takes recorded, further secondary and tertiary passes were made reducing this grid spacing to 1 metre where required until the grout take was negligible. The effect of these treatment iterations were effectively self validating however pre and post grout SPT and CPT's were carried out to record the improvements to the soil strength.

The principal quantities involved were;

- 642 No rotary percussive boreholes up to 12m deep - 5,487m of drilling
- 1,090 Tonnes of pfa/sand/cement /bentonite grout injected beneath the carriageway.

The work was carried out during lane possessions. However to reduce traffic disruption the programme was reduced by working on a 24/7 basis. Drilling was carried out using a Klemm KR 904 Geotechnical drill rig in conjunction with a smaller 5 tonne limited headroom rig to complete angled drilling beneath the gantries and adjacent to live lanes to remove the risk of the mast encroachment over the open carriageway.

