

Agenda



Kevin Mackenzie, Managing Director, GDL

- **Who are GDL and our services**
- **How soil stabilisation techniques can be used to reduce construction make – ups and maximise reuse of site won materials.**
- **Stabilisation and mass stabilisation systems**
- **Case study Barratt Homes Mugiemooss, which involved re – engineering of asbestos soils**
 - Project requirements and purpose
 - Soil conditions
 - Design and regulatory approach
 - Execution of the works and safety control measures
 - Outcome

Ground Developments

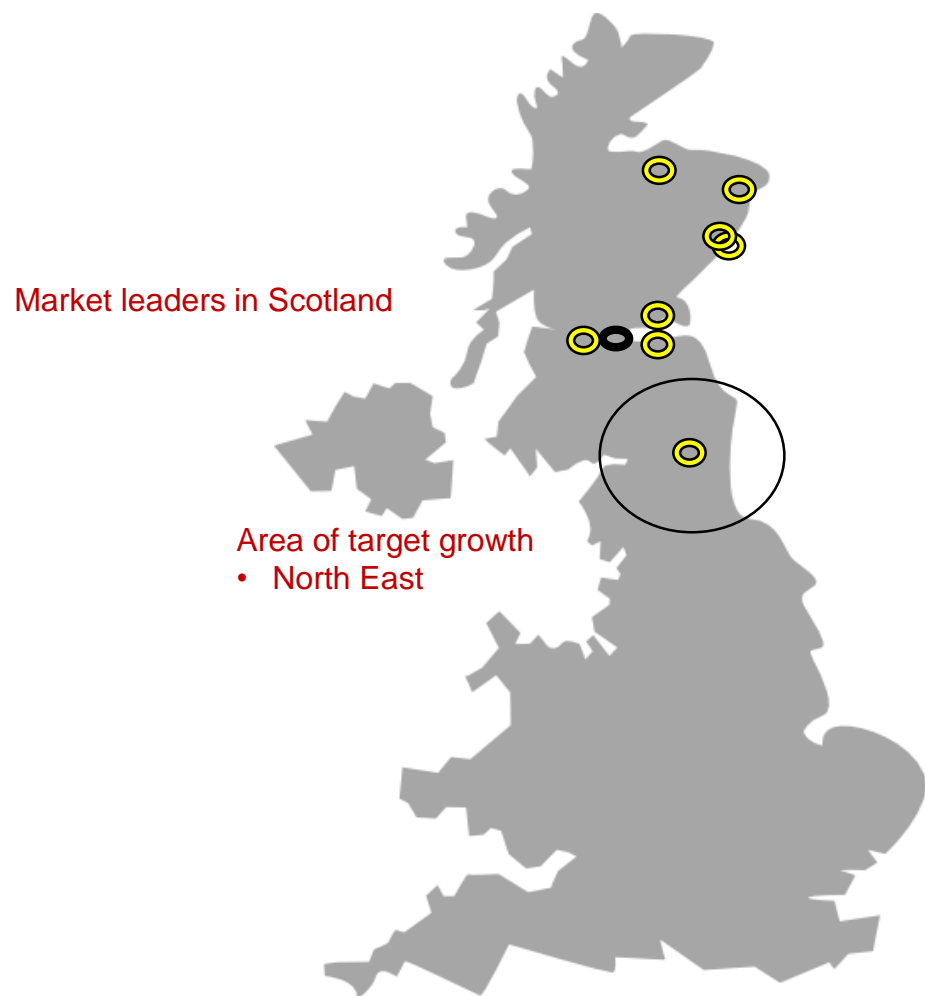


“A UK-leading specialist ground engineering business, that offers earthworks, a range of ground improvement techniques and piling”

- Engineering lead business
- Directly employed workforce
- Annual turnover £15 - 20m
- Large modern fleet of plant and equipment
- Large modern offices and maintenance facility






Locations



Service offering



| EARTHWORKS | GROUND IMPROVEMENT | PILING |
|--|---|--|
| <p>Underpins everything we do. Our enabling tool which allows us to self deliver and offer a unique proposition to clients.</p>  | <p>Soil Stabilisation / Modification</p> <p>Deep Soil Mixing</p> <ul style="list-style-type: none"> • Turbojet DSM • Mass DSM <p>Controlled Stiffness Columns</p> <p>Jet Grouting / Slurry Walls</p> <p>Vibro stone columns</p>  | <p>Continuous Flight Auger (CFA)</p> <p>Rotary Bored Piling / Large Diameter Pile (LDP)</p> <p>Displacement Pile (DP)</p> <p>Piled Retaining Walls (contiguous and secant)</p> <p>Driven Piling (Precast & steel)</p>  |

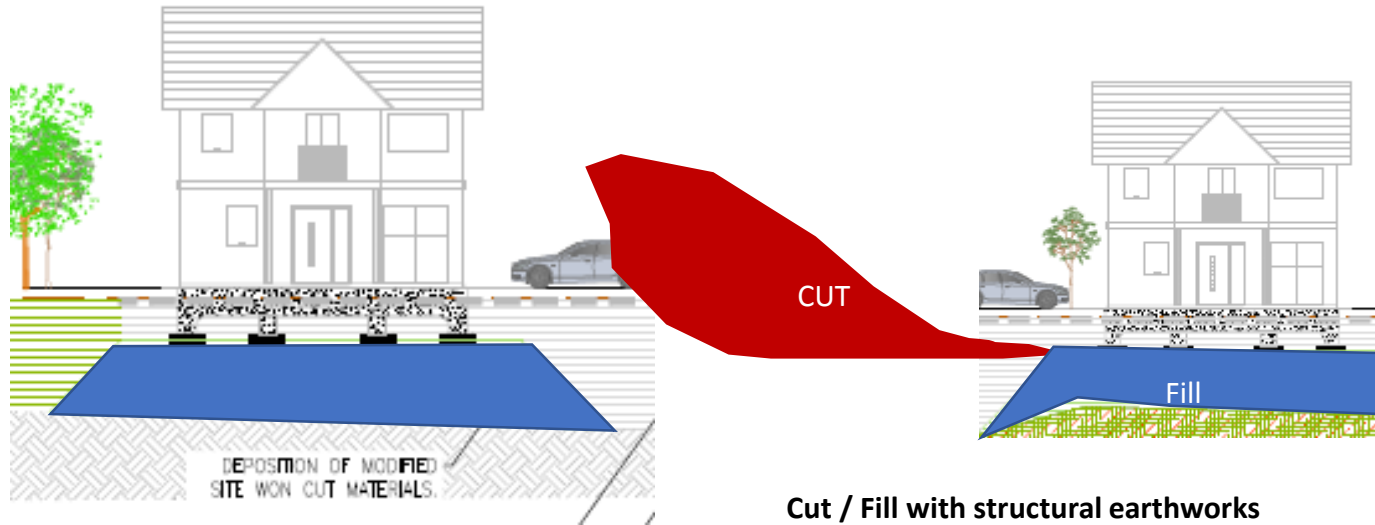
Whilst some of our techniques suit remediation applications, GDL are not Remediation Contractors. Rather we are a geotechnical contractor who can work with a wide range of materials types, some potentially contaminated. We acknowledge the place for specialist remediation contractors for more complex sites.

Ground Improvement: Poor Ground Options



- Abandon the project
- Dig and dump
- Avoid the poor ground
- Design the structure to minimise the effect of the poor ground
- Treat the poor ground to improve its properties
 - Many different approaches, combination often best
 - Prime goal to increase the bearing capacity of the soils

Stabilisation applications

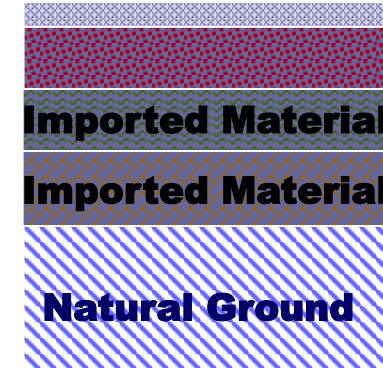


Earthworks podium

- Excavation to competent
- Stone / natural or stabilised fill
- Density driven fill regardless
- Std depth foundation on engineered fill

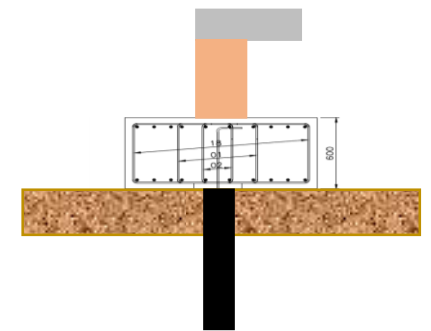
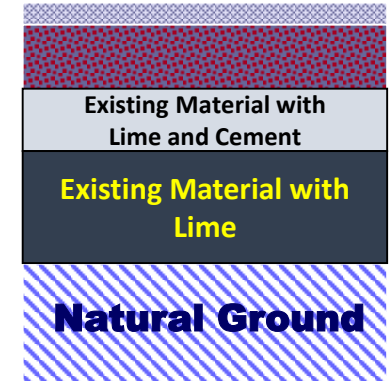
Cut / Fill with structural earthworks

- From competent formation
- Building on engineered fill, with std foundation
- May be natural soils, modified / stabilised or granular import
- Cut / fill required in any case why not do properly
- Provides solution at same time for roads / driveways etc



Road construction

- Reduced construction make up
- Elimination of imported capping layers



Stabilised Piling Mats

- Reduction in import / material off site

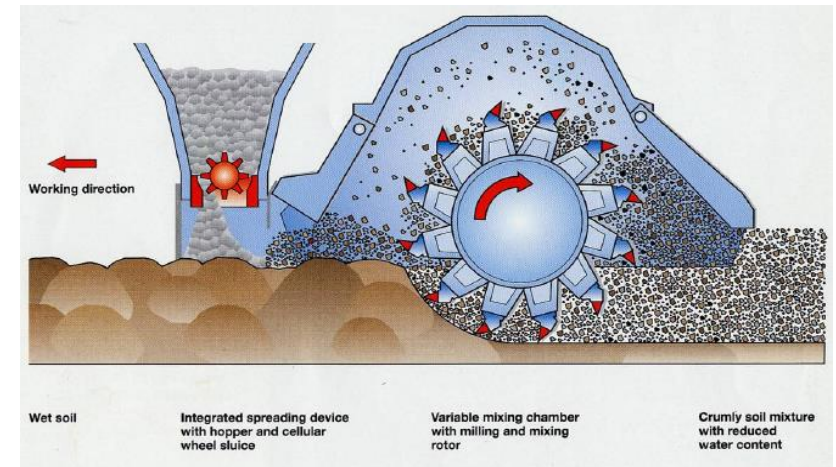
Soil Stabilisation / Modification: What is it?



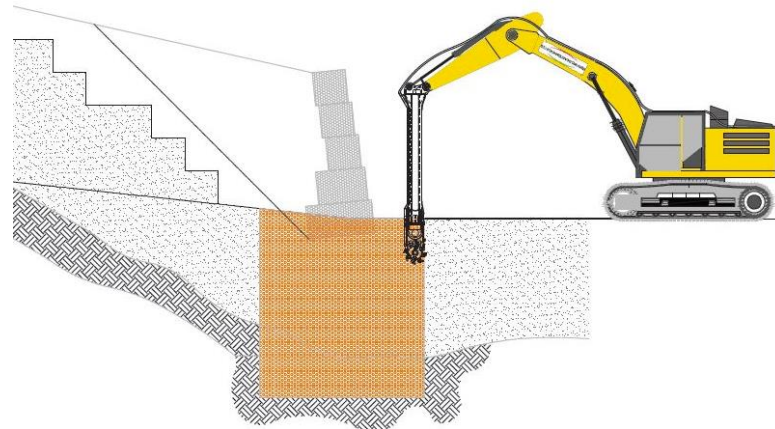
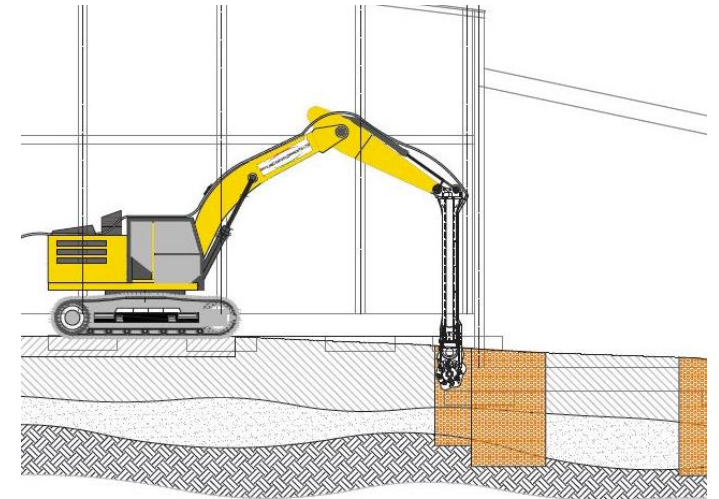
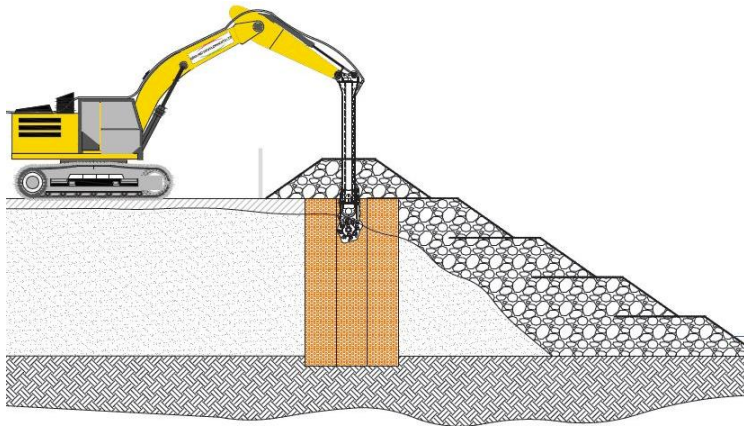
“The treatment of all types of soils to provide a material that is fit for a specified purpose or has a specified strength”



Soil Stabilisation / Modification: Rotavating Systems



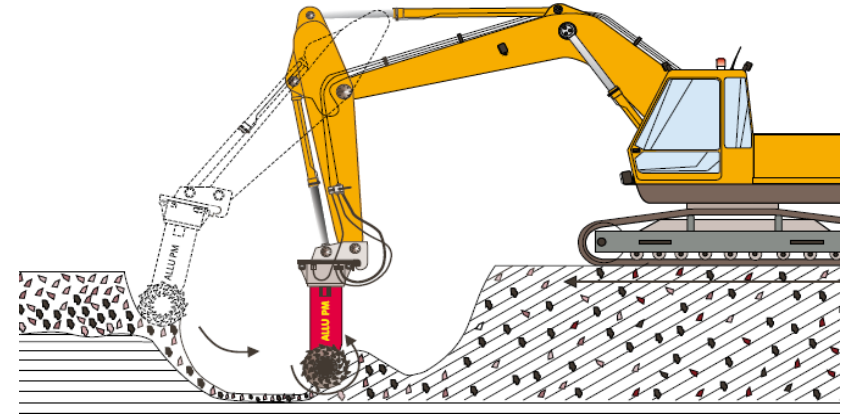
Mass Stabilisation - applications



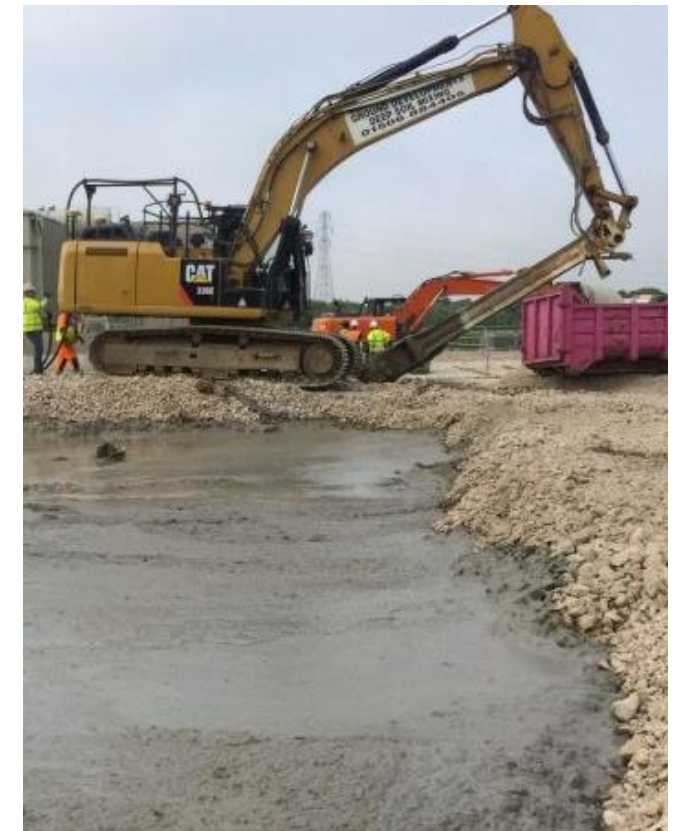
Deep Soil Mixing: Mass In-situ Stabilisation



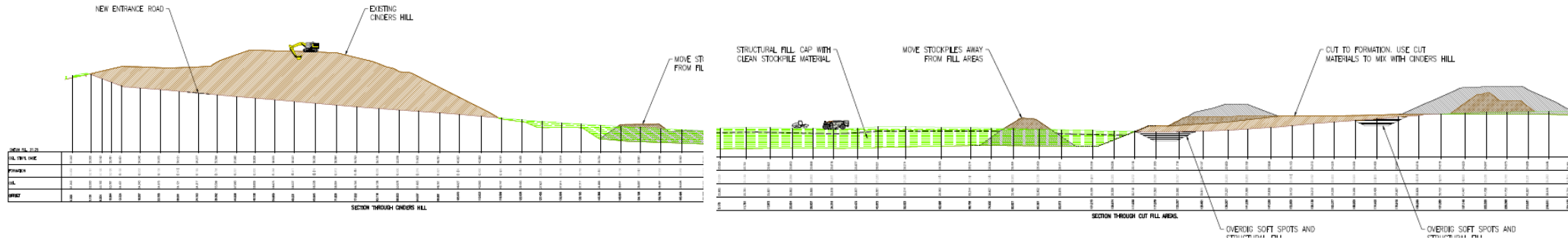
- Treatment of depths up to 6m
- Cost effective compared with excavation / replacement
- Groundwater cut-off solution
- Contamination / hazardous material encapsulation
- Suitable for smaller works / incidentals
- **GDL modified high pressure rotavating unit to better suit UK soils**



Deep Soil Mixing: Mass In-situ Stabilisation



Barratt Homes, Mugiemoss



Housing Development

Main Contractor: GDL

Earthworks Volumes

Topsoil 15,000m³
Cut / fill 160,000m³
Formation 25,000m³
Screening 60,000m³
Modification 60,000m³

Ground Conditions

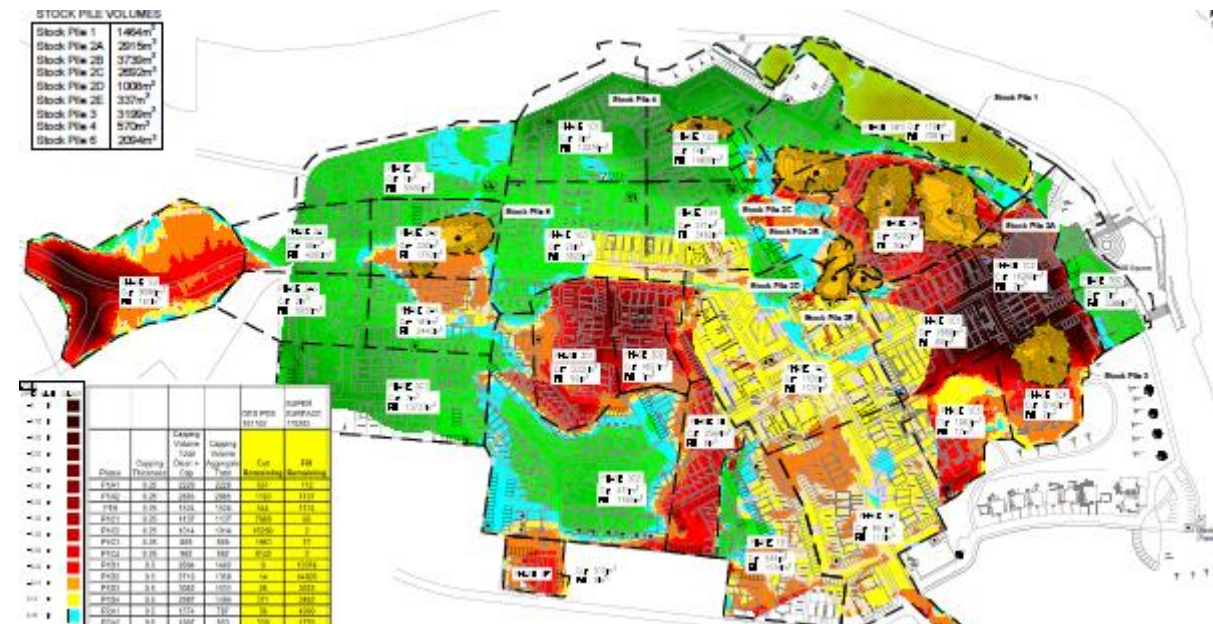
Soils generally comprises silty sand and gravels natural moisture content in the order of 14% opposed to optimum 9%. High silt fraction extremely sensitive to any increase in moisture

Earthworks specified requirements

Building: end product compaction to 95% of materials DD, less than 5% air voids
CBR value >30%

Car parking / roads / hardsatanding: end product compaction to 95% of materials DD, less than 5% air voids
CBR value >15%

Playing fields: bulk fill to CBR 5%, final layer >15% CBR



Barratt Homes, Mugiemoss Asbestos



Soils within the cinders hill area of the site contained elevated levels of contaminants including heavy metals, poly aromatic hydrocarbons, petroleum hydrocarbons, VOC's and asbestos containing materials.

Asbestos in samples comprised chrysotile and amosite fibres with very low concentrations in the range of <0.001% - 0.002%

Fairhurst had obtained regulatory approval for the materials reuse in engineering materials provided certain control measures were in place.





Approach to Asbestos Soils, Mugiemoss

Appointment of asbestos consultant (in this case ESG Asbestos)

Assess licensable status of the works in accordance with Control of Asbestos Regulations 2012

Develop Asbestos management plan to consider;

- Ensure working practises do not cause asbestos fibres to become airborne
- Proposal for trained asbestos analyst to carry out ambient operative and boundary air monitoring
- Recommendations for minimum level of staff training
- Recommendations for supervision
- Appropriate PPE
- Method statement, stating out the fate of any known / unknown and / or unexpected asbestos contamination e.g. Large caches of ACM
- Details to be contained in a validation works to confirm appropriate mitigation measures in been implemented in accordance with the plan

Staff Training – asbestos awareness all staff on site, supervisors Non – licensed asbestos work training

Task risk assessments for dealing with asbestos containing soils

Implement control measures

Review control measures on regular basis and make changes

Barratt Homes, Mugiemooss













Questions