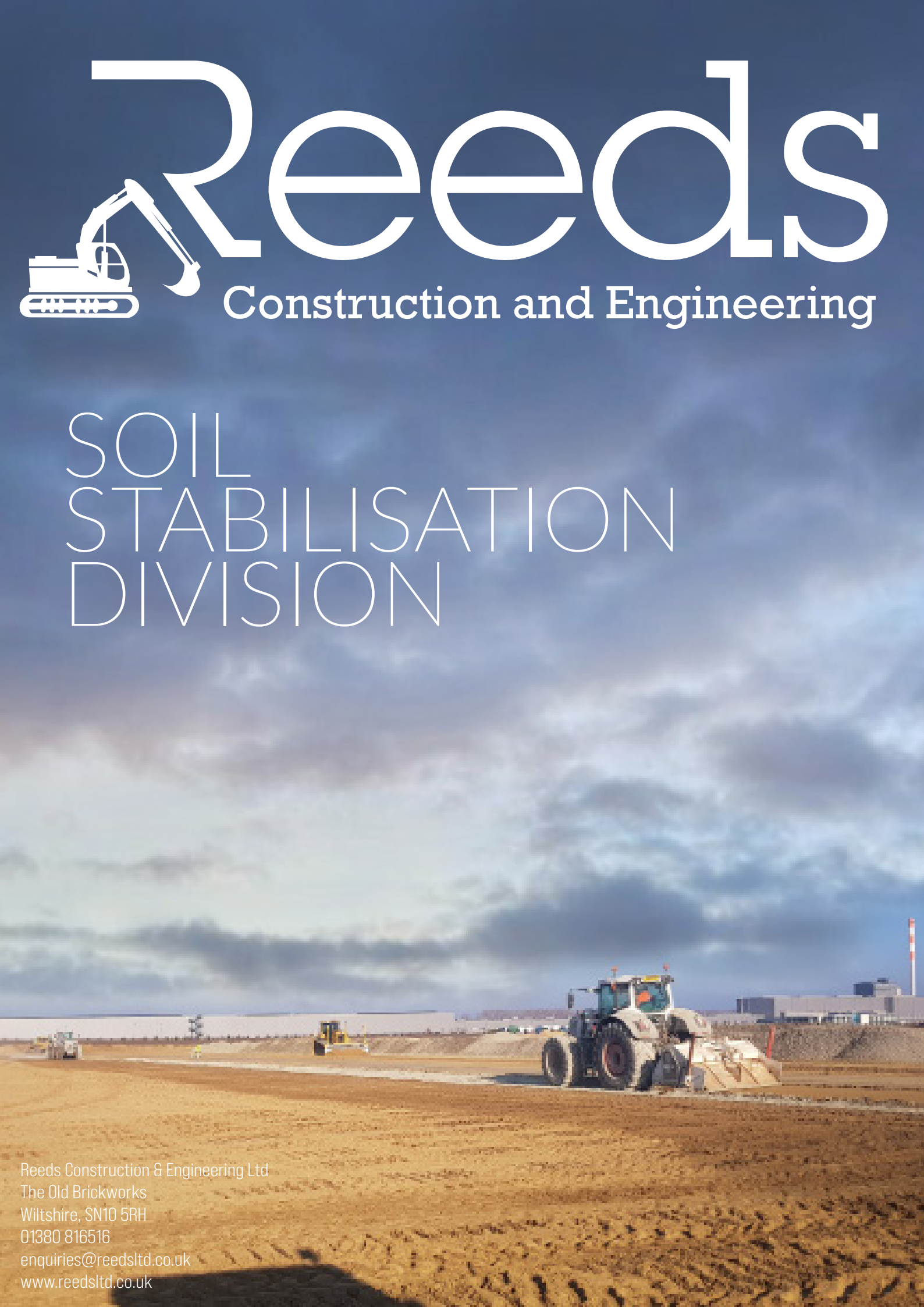
Reeds

Construction and Engineering

SOIL STABILISATION DIVISION



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"Pioneering Sustainable Solutions for Natures and Constructions Challenges"

IN THIS BROCHURE

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OUR ACCREDITATIONS & INSURANCES

SSIP · AAC ISO 9001 · UKAS MANAGEMENT SYSTEMS 8190 · CHAS Accredited Contractor www.chas.gov.uk · Constructionline Gold Member · CPA CollectiveMark · Smas WORKSAFE · AVETTA MEMBER

A COMPANY OVERVIEW

With mounting pressures on our natural resources and a growing importance to maximise existing project requirements, Reeds Construction & Engineering champions sustainable, innovative, and environmentally friendly construction methodologies and processes.

The practice of transporting millions of tonnes of geotechnically challenged or contaminated material to landfill each year and replacing this with imported aggregate is increasingly obsolete, especially when you consider that many of these so-called unacceptable materials can cost effectively be made fit for purpose on-site. Where disposal options are extremely costly, environmentally unfriendly and highly disruptive to the local communities, alternative approaches such as utilising soil improvement, stabilisation and other similar mixing methodologies remove these impacts and maximise reuse on-site.

Our expertise in treating and improving geotechnically unsuitable and contaminated soils has seen annual production growth in excess of 3,000,000m^3 per year, equating to an annual saving in excess of five million tonnes of "waste", which in turn equates to a saving as a minimum of 350,000 truck movements a year, either on or off projects throughout the UK.

Sustainable and innovative outcomes need to be carefully considered at the project out set, as often there are numerous ways to address these geotechnical and contamination challenges encountered on a site, and these may not be exclusive to one another. Experience has shown us that the best solutions are often derived from adopting a holistic and varied approach to the issues encountered, thereby delivering an effective overall strategy. Our broad range of expertise enables us to quickly consider these options and to be able to offer solutions on how best these challenges might be addressed.

Reeds, established over 35 years ago in Wiltshire, has emerged as a prominent UK specialist in the Plant and Engineering sector, whilst also becoming the largest provider of Ground Improvement in the UK construction sector. Our commitment to professionalism, efficiency, and customer care resonates across all our operations.

Reeds maintains a strong reputation in plant sales, repair, and maintenance, balancing flexibility with the capability for major repairs and overhauls, while our well-developed supply and hire business provides a diverse range of plant and construction machinery. By collaborating closely with top manufacturers in the UK and Europe, we are able to offer a vast array of products to customers, also ensuring clients benefit from the extensive in-house expertise in the practical use, maintenance, and repair of such products.

"An in-house capability to handle and assist-in, a wide spectrum of ground material improvement solutions".

Reeds, an early pioneer of innovative soil improvement and stabilisation techniques within the then fledgling treatment industry, has allowed growth and development of expertise. We are now one of the most knowledgeable and foremost providers of solutions, utilised by our numerous clients across all types of projects throughout the UK.

As a specialist company focusing on the demanding and challenging environment of ground improvement, with our unique in-house capabilities to handle a wide variety of projects requiring materials improvement, stabilisation, solidification, cementation (CBM / HBM's) and remediation, whilst seeking to ensure the projects we undertake maximises material retention and reuse, also minimising expensive imports wherever possible.

We seek to tackle all our treatment projects with the upmost speed and professionalism, working closely with our client and/or main contractors, as though we are all partners. We always prioritise seeking to find the most timely and cost-effective solution for all, utilising our experience and deep understanding of the processes necessary to bring this all to fruition, catering for all sizes of client and projects, whether it's sport pitches or large construction projects such as HS2.

Through the use of our wide range of specialist and flexible plant we have gained considerable experience in dealing with all the various soil groups encountered throughout the UK and Ireland. Soil, as an engineering material, has to be truly understood to maximise its benefits and minimise the costs associated with its treatment. With the varying soil types that occur, particularly throughout regions, it is critical to understand the make up and unique characteristics of each of these soils. With our extensive experience, we seek to support all our clients through the various processes and stages necessary to achieve the successful treatment outcomes required.

Our in-house capabilities, in conjunction with our external testing and validation partners allows us to provide effective alternative construction treatment solutions for clients. It is our philosophy to provide an unrivalled service encompassing quality workmanship, value for money, and exceptional customer care, backed up by a wealth of expertise from professionally trained and dedicated personnel and operators.

We have been assessed and certified as meeting the stringent ISO 9001 and other construction accreditation standards for quality and environmental protection management. Together with health and safety, these are core to Reeds' daily operating standards.

STABILISATION

Generated generally through physical, mechanical, chemical, and highly cementitious actions.

Binders for soil stabilisation typically include Lime, Cement, Pulverissed Fuel Ash (PFA), Ground Granulated Blast-Furnace Slag (GGBS), and or combinations of these. Stabilisation generally requires a significantly higher percentage of binder additions to ensure the cementitious action needed for long-term durability and strength. Where improvement and modification can be more flexible and adjusted to varying materials and weather conditions, stabilisation is more prescribed. Pre-start mix design and testing are essential to confirm that any proposed stabilisation mix meets laboratory standards and the desired end-product, before construction commencement.

Pre-start testing also ensures that fill materials are suitable, especially regarding Total Potential Sulphates (TPS) and organic matter. High levels of these contaminants may

STABILISATION inherently enhances a natural soils characteristics well beyond their original properties, fixing such enhanced characteristics, providing long-term durability, enhanced strengths, and ultimately providing an environmental and cost-effective alternative to traditionally imported solutions.

make traditional stabilisation methodology unfeasable, especially if there's a risk of soil heave affecting finished structures and/or road pavements. The mechanical action of modern machine mixers is critical to achieving the required pulverisation for full compaction.

Stabilisation often uses selected materials to meet stringent specifications and ensure long-term durability for pavement standards. The goal is to create enhanced products that can replace and or supplement imported materials like Capping material, Type 1, Hydraulically Bound Materials (HBM), and Cement Bound Materials (CBM). This process allows site won materials to mimic expensive traditionally imported construction products, thereby generating significant savings and environmental benefits.

Stabilised materials must exhibit specific characteristics to meet project requirements / specifications. These include high California Bearing Ratio (CBR) values (15%, 30%, 50%), over 95% compaction, >95 kPa HSV, <5% air voids, and >30% pulverisation. These characteristics are essential for meeting overall pavement design requirements and providing durable, stable construction materials, in the upper pavement layers and/or under structural foundations.

IMPROVEMENT

Generated through a physical and mechanical action only.

Soil improvement can be achieved through physical methods, such as breaking up boulder clays with rotors or discs. Water may be applied as needed, and overly wet materials can be spread out and turned in favourable weather to aid drying. These processes prepare materials for construction, where they can be compacted according to standard practices.

Additives like Lime, Cement, PFA, GGBS, and water expedite soil improvement and manage site and weather conditions year-round. The choice of mixing equipment varies based on project scale, accessibility, and desired outcomes. Options range from simple excavator setups to advanced high-energy rotor units capable of dust-free operation, ensuring solutions for diverse project requirements.

Additive percentages are kept low, just enough to achieve the required improvement, with modern equipment allowing precise control over these percentages, meaning binder wastage is minimised. It is essential to assess Total Potential Sulphates (TPS) and organic matter levels to adjust mixes or halt treatment if contaminant levels are too high.

Binding agents are applied using methods tailored to project specifics. These include bagged applications for small projects, granulated products delivered by lorries for larger ones, and fine powders dispensed by bulk tankers. Mechanised spreaders ensure precise application, whether towed or self-propelled with their onboard auger units.

Additives and physical actions help U1A materials reach the desired classification and specifications for Class 1, 2, or 3 materials. The goal is to achieve parameters comparable to natural materials at their optimum moisture content. Treating U1A materials with lime or cement ensures they attain sufficient strength, stability, and compaction, meeting standard requirements for bulk fill placement, as outlined in specifications like the Specification for Highways.

Improved bulk fill is generally expected to exhibit characteristics such as a 5% CBR, 95% compaction, HSV > 65kPa, and reduced air voids (where stipulated).

Soil Improvement doesn't fundamentally alter soil beyond its natural state; rather, it restores its suitability for construction. Techniques like lime or cement improvement treatment ensure soils meet engineering standards, fulfilling their intended function in construction projects.

MODIFICATION

Generated through physical, mechanical, chemical, and natural cementitious actions.

Modification is similar to improvement, but it introduces significant differences due to the specific chemical and cementitious actions when lime binders are added to cohesive clay or chalky clay. Alongside the benefits of improvement techniques, modification induces a chemical reaction within clay ions, resulting in a natural cementitious action within the final materials. Lime additives expedite soil modification processes and effectively manage site and weather conditions year-round, with low percentages added just enough to achieve the desired modification required.

Understanding the levels of Total Potential Sulphate (TPS) and organics is as crucial for modification as it is for soil improvement. The methods of addition and processing are also similar. When applied to U1A clay or chalk material, additives and physical actions dry and break up the material, enabling it to meet specifications for Class 2 or 3 fill.

The goal of material modification is to achieve finished parameters comparable to natural materials at optimum moisture content. Treating unsuitable U1A clays and chalks with lime imparts desired engineering properties, such as strength, stability, and compaction, akin to naturally occurring materials that have been placed and compacted at their optimum moisture content. Additionally, the cementitious action within the clays increases durability and improves the impermeability of the finished fill. The typically accepted finished characteristics for modified bulk fill are again 5% CBR, 95% compaction, HSV >65kPa, and reduced air voids (where stipulated).

Soil modification in addition to restoring the characteristics of clay and chalk soils for construction purposes, can notably enhance the durability and impermeability of cohesive materials through chemical and cementitious actions. Techniques such as lime modification not only ensure soils meet engineering requirements, serving their intended function in construction projects, but also offer substantial long-term benefits.

THE DIFFERENCES

BETWEEN USING LIME & CEMENT BINDERS IN SOIL TREATMENT

Cement primarily consists of calcium silicates and aluminates, which hydrate with water to form a rigid matrix that binds soil particles, meaning soil plasticity is reduced and workability is improved. Cement is effective for a wide range of soils, particularly those that are not clay-rich. It provides initial soil drying through hydration, whilst also offering rapid strength gain, making it suitable for projects requiring quick load-bearing capacity.

In contrast lime, typically quick lime (CaO) or hydrated lime ($Ca(OH)_2$), reacts with water and clay to form calcium silicate and aluminate hydrate, strengthening the soil. Lime is best suited for clay-rich soils, as it alters their properties more effectively. Quicklime absorbs moisture and undergoes a hydration reaction significantly reducing the moisture content of wet soils, working to increase the plastic limit and reduce the plasticity index, making clay soils appear drier and more workable. Although cement's strength development is slower than lime, it continues over a longer period, often resulting in greater long-term strength.

BENEFITS

Using cement improves soil strength and durability quickly, making it suitable for heavy loads and harsh environmental conditions. It enhances workability, reduces soil moisture through hydration, accelerates construction timelines, and provides a durable foundation for pavements and other structures.

Lime, on the other hand, is ideal for modifying and stabilising clay-rich soils. Quicklime effectively reduces moisture in waterlogged sites, increases soil workability, improves load-bearing capacity, and offers environmental benefits due to lower CO_2 emissions. Lime is also cost-effective, reducing the need for excavation and disposal of unsuitable materials, thus lowering construction costs.

COMBINED USE

Combining Lime and Cement can leverage the strengths of both binders, resulting in improved soil stabilisation. Lime can pre-treat clay soils, making them more amenable to cement stabilisation. Understanding the differences and benefits of lime and cement binders allows engineers to make informed decisions, optimising soil treatment to meet specific project requirements.

Reeds soil treatment capabilities support various earthworks operations:

·Keeping sites operational during periods of adverse weather.
·Rapidly drying up boggy, saturated and rain damaged areas, thereby allowing earthworks operations to resume swiftly and or commence.
·Creating stable temporary and permanent platforms, enabling earthworks operations to traffic sites and ultimately provide "Working Platforms" for heavy cranes and piling rigs etc.
·Treating site materials for use as bulkfill, enhanced subgrades, capping layers, and sub-base replacements.
·Providing High Strength CBM's and HBM's these products, especially in conjunction with power floating can make excellent pavement alternatives for tracks and access roads.
·Providing structural fill materials for Earthwork Retaining Structures thereby addressing existing weak soils making them suitable for construction. Instead of regarding such soils as either a mass to be contained by force and or disposed of, such treated materials in conjunction with geo-textile reinforcement, can become an integral part of the structure and the solution to the problem.

QUALITY VALIDATION & VERIFICATION

Reeds undertakes challenging projects, focusing on stringent quality and environmental controls certified to ISO 9001 and other standards and compliance. Soil, as an engineering material, differs from coherent solids like steel or concrete due to its particulate nature. Understanding particle characteristics, composition, and internal structure is crucial for assessing physical properties such as strength, stiffness, permeability and potential contaminants.

Testing protocols vary widely depending on soil type, ground conditions, and intended site use:

Site Investigation Phase: Generally initiated by third-party clients and/or main contractors, this phase should identify soil composition, physical properties, and any contaminants like sulphates (in particular Total Potential Sulphates) or acidity/alkalinity. Tests include chemical analysis, moisture condition values, particle size distribution, and strength evaluations to inform ground engineering solutions.

Pre-Construction Phase: Repeating site investigation tests verifies findings and refines binder selection. A detailed quality and environmental plan outlines construction phase testing requirements, ensuring compliance with project specifications and environmental considerations. The Clients and or an external consultant, may need to validate design solutions and proposed construction phase testing, prior to commencement.

Construction Phase: Ensures precise control over soil water content and compaction during earthworks. Tests may include Total Potential Sulphate (TPS), Nuclear Density Meter (NDM), Hand Shear Vanes (HSV), Air Voids (AV), Pulverisation, Californian Bearing Ratio (CBR), and others tailored to material type (cohesive or granular) and also dependent on the material being produced. Daily monitoring includes, deliveries, work locations, layer number, treatment areas, noise levels and environmental conditions to mitigate local community impact.

Verification Phase: Confirms compliance with contamination standards and project specifications through tests like chemical analysis, NDM, CBR, and plate bearing tests. Detailed reports include project description, test results, and technical conclusions, validated by external consultants (where necessary).

These phases ensure thorough assessment and validation of soil treatments, supporting the delivery of high-quality, environmentally responsible solutions tailored to individual project requirements.

PLANT & EQUIPMENT

Reeds owns, operates and maintains an extensive specialist plant fleet, ensuring versatility and capability across all diverse soil types and project needs to be found in the UK and Ireland. Having the largest and most diverse soil treatment fleet in the UK, enables Reeds to undertake treatment projects both large and small, catering for all its clients needs.

Plant investment decisions prioritise these factors, crucial for operating effectively in the varied conditions encountered within the UK and European markets. Much of Reeds plant has been custom-developed in collaboration with manufacturers or modified internally based on insights from its Stabilisation Division and or its Plant & Engineering Division.

TRACTORS:

Large HP Tractors, for towing and powering stabilisation rotors, crushing rotors, large capacity Pichon water tankers and towed binder spreading units. As agricultural tractors they are of course specifically designed to handle different soil conditions and varying terrains with ease, being an essential part of Reeds arsenal and provide significant benefits in delivering the many various construction needs on the ever-changing projects that Reeds encounter in undertaking their works. Reeds boast a large fleet of modern tractors utilising the latest engine technology to lower emissions and environmental impact.

WIRTGEN SELF-PROPELLED MIXER UNITS:

These highly specialist units in both their integrated spreader and mixer only forms, provide maximum outputs on larger projects, where their full capabilities can come to the forefront. With their large integrated mixing drums, they are able to undertake soil treatments at varying layer depths, even up to 500mm where compaction will allow such placement depths, but typically working at between 250 – 300mm deep.

VARIOUS MIXERS:

·Rippers and civil engineering disc harrows, handle large boulder clays especially in the base of fills and providing starter layers in difficult conditions. Generally suitable for projects or areas needing CBR values of 3 - 5%.

·Rotovator units (mounted on back of tractors), provides the thorough mixing and pulverisation of the soils and binders, facilitating controlled binder mixing at depths up to 350mm and providing uniformly mixed materials ready for compaction. Suitable for construction layers needing CBR values 5% - 50% as the design / specification may dictate.

·Integrated Towed Rotovator units (hitched on back of tractors), as described above but with the added benefit of dustless spreading and mixing, being ideal in environmentally sensitive situations where it's essential to minimise airborne contaminants.

VARIOUS SPREADERS:

Spreading units distribute binders like Lime and Cement onto the ground for incorporation into the construction layers being treated, via computer-controlled augers so as to precisely measure and control these additions.

·Towed Spreader units powered by tractor units.
·Self-propelled spreaders for large sites with poor ground conditions, ensuring efficient binder distribution and incorporation.

SILO-TANKERS:

These semi-static Silo-Tank units, are used to receive and store binders delivered to sites on a daily basis by articulated road tankers. These static units allows all the delivered binders to be stored in controlled and dry conditions, and for these materials to be discharged from the silos by means of their on-board pressure pumps as when required into the chosen spreader. These tanks allow for the safe temporary storage of between 38 – 50 m^3 of binder product.

PICHON WATER TANKERS:

These modified water tankers allows for the precise addition of water via their ripper delivery system, directly into a layer, ready for it to then be thoroughly mixed with any added binder at the appropriate moisture content, thereby ensuring full hydration of the added binders and full compaction at or around the materials Optimum Moisture Content (OMC). These large capacity units also have their own self-loading pumps, so provided an accessible water source is available they can operate independently loading and spreading water as where it is required.

These specialised plant capabilities enable Reeds to deliver comprehensive ground treatment solutions, adapting to the specific demands of each project with precision and efficiency.

With Reeds dedicated teams of operatives, fitters, managers, a leading plant fleet, extensive experience and know-how, we are more than confident that we have all the means to deliver the modification / stabilisation Solution you are seeking and look forward to talking with you.

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