

SITE REGENERATION & REMEDIATION THROUGH MATERIAL REUSE

Through soil remediation, recycling, material repurposing, solidification, and overall site improvement, JJ Mac seeks to offer its clients the most economical and effective solutions to regenerate their projects by the deployment of JJ Mac's extensive in-house capabilities.

"Site development utilising earthworks and stabilisation is straightforward enough; however, effective site regeneration requires partnership."

To provide and deliver bespoke, innovative, creative, and effective solutions for clients, early participation and time investment in a project are essential. Overcoming varied geotechnical and environmental challenges, particularly on brownfield sites, of course requires cost-effective solutions, to ensure any redevelopment remains feasible.

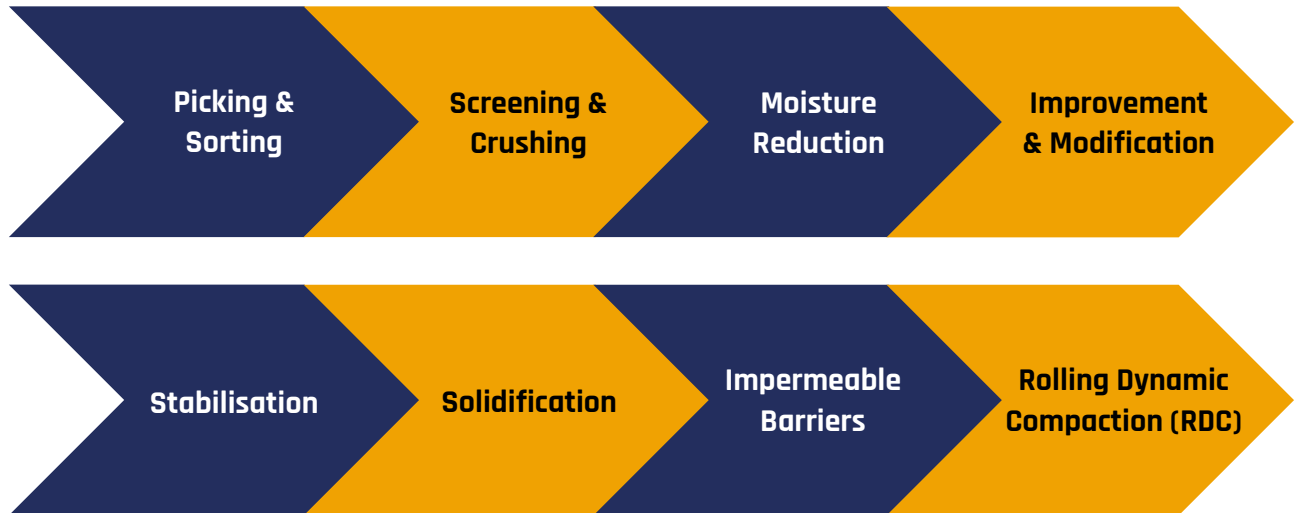
While regeneration cannot entirely eliminate the need for disposing of *hazardous* materials, timely planning and thorough preliminary investigations can often minimise the quantity of such material. With the potential of often rendering *inert/non-hazardous* materials acceptable and geotechnically suitable for reuse in the works. Be it that *non-hazardous* materials may need to be secured in designated safe zones, with potential leachate pathways minimised through Soil Stabilisation and Solidification (S/S).

Successful outcomes can only be achieved through thorough consultation with all stakeholders from the outset. JJ Mac seeks to develop a clear understanding of the issues and objectives connected with each scheme, providing workable solutions through effective **Materials Management Plans (MMP)** & **Construction Environmental Management Plans (CEMP)** that seek to limit disposal and maximise the reuse of site-generated materials.

Project regeneration is a comprehensive and integrated means of resolving complex project issues, however, with our vision, planning, and decisive action, it is our aim to provide lasting improvements within the economic, physical, and environmental constraints, ensuring wherever possible, the simplest construction solutions are employed, thereby ensuring the timely and successful completion of such projects.

Re-engineering soils and materials for reuse is a broad subject with many options. Therefore, when considering materials regeneration, remediation, and repurposing, it is crucial to stay flexible and adjust plans as needed. Even the most investigated and considered sites can unearth unknown or unexpected challenges, but at JJ Mac, we pride ourselves on our ability to react effectively to such challenges, our 20 years of successful business experience, enabling us to mobilise significant and varied in-house capabilities to overcome such issues.

JJ Mac's - SITE REGERATION & REMEDIATION PROCESSES & TECHNIQUES



REMEDATION & RECYCLING

“The art of turning ‘Waste’ into valuable construction material.”

JJ Mac offers a package of solutions to its clients and end users who face site remediation issues.

With the ever-increasing requirement to remediate brownfield sites instead of the previous trend of focusing on greenfield developments and or simple dig & dump solutions, JJ Mac has continued to grow its remediation capabilities.

Holding “**Waste Management Licences**” and having the necessarily trained **Waste Management Training & Advisory Board (WAMITAB)** staff, enables us to treat both contaminated and non-contaminated materials classified as waste, either directly and or in partnership with our proven and tested consultants.

JJ Mac can carry out remediation **in-situ or ex-situ** depending on the logistics of the site. Its remediation portfolio includes treatment by picking, sorting, screening, crushing, soil improvement, soil stabilisation, encapsulation, solidification, migration barriers and the installation of contaminant barrier walls.

JJ Mac works closely with the client's selected consulting engineers and plays an active role in the identification and development of the final remediation strategy to be used. It has vast experience in remediation gained through the many and varied projects it has successfully carried out over the years.

With the banning of the mixed disposal of hazardous, non-hazardous and inert waste back in July 2004 and the dramatic reduction in the number of landfill sites able to accept hazardous waste, the industry has seen

an exponential increase in the cost of sending contaminated materials to landfill. This action, coupled with the need to pre-treat 'waste' prior to its disposal to landfill, made it apparent to JJ Mac that innovative on-site solutions had to be developed that allowed potential 'waste' materials to be treated using effective and affordable methodologies.

As an earthworks & materials re-engineering specialist, JJ Mac actively seeks to recycle materials as a valuable construction material, for use in its ground improvement projects and general construction, thereby addressing the traditional "dig and dump" mentality prevalent in the past.

Material reprocessing or recycling is the ideal solution for transforming unusable or mixed materials into usable aggregates. These aggregates can then be utilised as a valuable source of construction material.

JJ Mac operates its own specialist plant that can be mobilised and up & running quickly, providing the ability to recycle waste materials on-site which previously may not have been viable to treat, or which would have been treated and then sent to landfill.

During the design assessment phases of a project, we actively seek to find solutions that allows the site arisings to be remediated, recycled and incorporated into the final scheme wherever possible, ensuring always that due consideration is given to both the temporary and permanent requirements of the project.

SOIL REMEDIATION AND SOLIDIFICATION - UTILISING LIME AND CEMENT BINDERS

Combining Lime, Cement binders, and additional treatments tailors soil remediation and solidification to specific contaminants and site conditions, yielding effective, durable, and eco-friendly outcomes. During the design assessment phase, it is crucial to evaluate the potential for remediating and reusing contaminated materials in construction. This ensures the treated materials meet all project requirements, maximising cost and environmental savings.

An initial detailed site analysis identifies soil characteristics, contaminants, and contamination extent. The appropriate binders and their proportions are determined based on these factors and the desired treatment outcomes.

Cement is often an effective binder for various soils and contaminants, providing rapid strength gain and forming an impermeable matrix that locks in pollutants. Lime is ideal for clay-rich or highly plastic soils, reducing moisture and enhancing workability.

The various stages of treatment generally consist of initial **Drying and Modification**: Reducing soil moisture and preparing it for further treatment, followed by **Chemical Reactions and Stabilisation**: Enhancing soil properties through chemical reactions, finishing with **Long-Term Solidification**: Ongoing reactions with lime and cement enhance soil strength and durability, further locking in contaminants.

Benefits of Soil Remediation and Solidification

- **Improved Soil Properties:** Enhanced strength, durability, and workability.
- **Containment of Contaminants:** Cement encapsulates contaminants, preventing leaching, while lime chemically stabilises them, reducing mobility and bioavailability.
- **Moisture Reduction:** Cement hydration reduces moisture content, improving stability. Quicklime absorbs significant moisture, crucial for waterlogged sites.
- **Environmental and Cost Benefits:** In-situ treatment minimises excavation and transportation, reducing costs and environmental impact. Lime produces less CO₂ than cement, offering a greener solution.
- **Time Efficiency:** Cement provides rapid stabilisation, while Lime continues to improve soil properties over time. Combining both offers enhanced moisture reduction, improved soil properties, and effective contaminant immobilisation.

Other Potential Additives and Treatments

- **Fly Ash (PFA):** Enhances pozzolanic reaction, increasing long-term strength and reducing permeability, especially effective with lime.
- **Ground Granulated Blast-Furnace Slag (GGBS):** Increases durability and strength, reducing environmental impact by using industrial by-products.
- **Organic Polymers & Bentonite Clays:** Improve soil strength and flexibility, creating a waterproof barrier for contaminant containment.

SITE REMEDIATION - INCONJUNCTION WITH ROLLING DYNAMIC COMPACTION (RDC)

JJ Mac's portfolio of solutions includes **Rolling Dynamic Compaction (RDC)**, a highly effective mechanism for compacting and consolidating weak and marginal in-situ soils at depth. It is an invaluable tool for brownfield and other development sites where sub-soil conditions present a geotechnical issue. Tackling problems at depth enables JJ Mac to re-engineer the soil and improve its shear strength and weight bearing capacity, thereby reducing the need for more costly solutions and/or disposals.

The process also identifies soft spots in the subgrades which can then be excavated and treated, prior to replacement. RDC is carried out until effective refusal of the material being treated is achieved. Typical average induced settlement can be 5% to 10% of the material thickness being treated, minimising potential differential settlement. RDC provides rapid, effective coverage of a site and on general earthworks projects may allow thicker fill layers to be placed. The process can compact in excess of **3000m³ per hour per unit**.

JJ Mac's **RDC** units deliver in the order of **100kjl per blow**, the impact of the module on the ground transfers energy to the soil grains forcing them closer together, the depth of influence is dependent on the soil type and moisture content but can be in excess of **5 metres** in some situations.

RDC on its own cannot change poor soils into good material but is an extremely powerful tool when used in conjunction with JJ Mac's soil modification, improvement and stabilisation capabilities.

RDC can also be a powerful tool for assisting in the dewatering of sites prior to any upfilling operations commencing. By improving the sub-formation, a firm working surface can be produced, providing the firm working platform/transfer mat for the **RDC** roller to run on and by installing drainage pathways into the underlying sub-formation prior to such rolling can also accelerate any dewatering effect. Then by carrying out **RDC** daily over an extended period, the underlying pore water pressure can be released.

RDC rolling is generally continued until "**effective refusal**" is reached across the whole of the project area. The process also has a key role to play in the development of brownfield sites, as it can minimise the impact of future differential settlement, often experienced on projects with underlying made-ground and unknown previous uses etc.

RDC can be very effective on brownfield sites to also break-up **old pavements, hardstanding areas, concrete slabs**, etc. as well as separating re-bar from its integral concrete structure. The recovered aggregates can then be incorporated into the ground solution thereby reducing the need for imported virgin aggregates.