

# Bridgestone Warehouse

Mass Soil Mixing for Foundation Enabling Works



**1,500+ m<sup>3</sup>**

Total Volume Mixed

**300+**

MSM Cells Constructed

**1.0 to 4.0 m**

MSM Treatment Depth

**2 Weeks**

Project Length incl Verification

## PROJECT OVERVIEW

The Bridgestone Warehouse at Signal Close, Lytton, is a large-format logistics and distribution facility developed by Port of Brisbane and delivered by head contractor McNab. The development comprises a warehouse of approximately 21,255 m<sup>2</sup> with associated offices, truck hardstands, carparks, driveways, and tanks. Ground improvement works were engaged to address foundation conditions in the designated high settlement zone, where geotechnical investigation identified unacceptable differential settlement risk without treatment.

## THE CHALLENGE

The site is underlain by reclaimed sand fill over high plasticity alluvial clays, with the sand fill thinning to as little as 0.1 m in the most critical areas following bulk earthworks, effectively placing proposed foundations directly over weak, compressible clay. Settlement analysis by Douglas Partners indicated total settlements approaching 97 mm in the worst-affected zone, well in excess of tolerable limits. The site was classified Class P under AS 2870, requiring foundation design by engineering principles.

Rather than treating the entire site footprint, the solution was targeted. DGSA's works were confined to the designated high settlement zone, identified through geotechnical investigation as the area at greatest risk, delivering the required foundation performance without unnecessary scope or cost.



MSM and CPT simultaneously working in the high settlement zone, Lytton QLD

## SITE GEOLOGY

Geotechnical investigation identified reclaimed sand fill across the site, with fill base elevations ranging from approximately 1.5 m AHD in the west to 4.5 m AHD in the east. Beneath the fill, high plasticity Holocene alluvial clays are present, characterised by low bearing capacity and high compressibility. In the high settlement zone, the residual sand fill following earthworks was as thin as 0.1 m, providing negligible separation between proposed foundation elements and the underlying weak clay. These conditions drove the requirement for an engineered ground improvement solution to achieve the load transfer and settlement performance specified for the dock and hardstand structures.

## PROJECT SNAPSHOT

### CLIENT

McNab

### OWNER

Port of Brisbane

### LOCATION

Signal Close, Lytton, QLD

### OUR SERVICES PROVIDED

Mass Soil Mixing (MSM)

### MSM CELLS

316 no.

### TREATMENT DEPTHS

4.0m (primary) / 1.0m (secondary)

### TOTAL VOLUME MIXED

1,566 m<sup>3</sup>

### VERIFICATION

Cone Penetration Testing (CPT)  
Unconfined Compressive Strength (UCS)

### PROJECT LENGTH

2 weeks including verification testing

## Our Solution

On-site Batch Plant, purpose-built cement mixing and delivery system

### MASS SOIL MIXING (MSM)

DGSA designed and constructed a Mass Soil Mixing treatment zone across the high settlement area using an optimised two-tier cell layout. Deep treatment columns, each 1.0 m x 1.5 m in plan and installed to 4.0 m depth, were combined with shallower 1.0 m deep cells at the alternating positions within the grid, creating a continuous composite ground mass across the full zone without treating every position to full depth. This approach reduced the total volume mixed to 1,566 m<sup>3</sup> compared to the 1,896 m<sup>3</sup> that uniform full-depth treatment of all 316 positions would have required, a material reduction of approximately 38% while maintaining the load transfer and settlement performance specified by design.

Ready-mix cement-water grout was delivered to site by agitator truck and discharged continuously into an on-site agitator tank. A cavity pump transferred grout from the agitator tank to DGSA's mixing rig, which mechanically blended the grout with in-situ soil to produce a uniform stabilised mass. A cement dosage of 120 kg/m<sup>3</sup> was applied consistently across all cells, targeting a minimum Unconfined Compressive Strength (UCS) of 200 kPa at 28 days. GPS guidance was implemented to maintain positional accuracy across the treatment grid.



MSM rig in operation, Lytton QLD



Cone Penetration Testing with excavator attachment of treated ground, Lytton QLD

### VERIFICATION TESTING

A comprehensive verification programme was carried out across the treatment zone. Cone Penetration Testing (CPT) was conducted at 51 locations, with individual cell CPT results assessed against a minimum average cone resistance (qc) requirement established relative to natural ground strength measurements taken outside the high settlement zone. A total of 81 UCS cylinders were sampled by Douglas Partners' Brisbane laboratory for representative cells, tested at 7-day, 14-day, and 28-day curing periods. Recorded UCS results at 28 days ranged from 149 kPa to 678 kPa, with a mean of approximately 390 kPa, substantially exceeding the 200 kPa design requirement across the majority of tested samples. Cells that did not initially achieve the CPT acceptance threshold were reworked and retested to confirm compliance prior to handover.

### OUTCOME

DGSA's targeted MSM programme delivered a verified, engineered ground mass across the high settlement zone, enabling McNab to proceed with footing and hardstand construction on a foundation meeting the specified strength and settlement performance requirements. The optimised two-tier cell layout, on-site batch plant, and GPS-guided positioning delivered 1,566 m<sup>3</sup> of treated ground across 316 cells within an approximately three-week production programme, achieving a material saving of approximately 38% against a conventional uniform treatment approach. The focused scope, limited to the highest-risk area of the site, provided an efficient and cost-effective solution for a challenging soft ground environment at the Port of Brisbane.