Case Analysis

Reliance Rail Maintenance Facility Auburn NSW

Market Sector
INFRASTRUCTURE

Application
DEEP IMPACT COMPACTION

Project Phase
UNCONTROLLED FILL

LANDPAC
INTELLIGENT GROUND ENGINEERING SOLUTIONS

Project

The development comprised the construction of a heavy industrial rail carriage maintenance building & 13km of rail formation including a rail loop. As the main contractor, responsible for the earthworks sub-contractor, ground improvement & site remediation processes, installation of atlantis drainage cells and sewerage crews, as-built drawings, asbestos removal & associated environmental & safety requirements. Project and Geological Review

Soil Conditions

Uncontrolled fills typically comprising railway ballast, ash, cinder and sand with some slag, metal, crushed sandstone and building rubble, in places clayey. The filling extends to depths of 0.5m to 5.2m and was variable in terms of compaction giving high potential for differential settlements across the site. Ground water was encountered between 3.6m and 5.8m and therefore any excavated footings following the HEIC works will be carried out above the water table.

Engineering Consultant: KBR

Main Contractor: John Holland

Geotechnical Sign off: Black Geotechnical

Ground Engineering Contractor: Landpac

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Geotechnical Solution

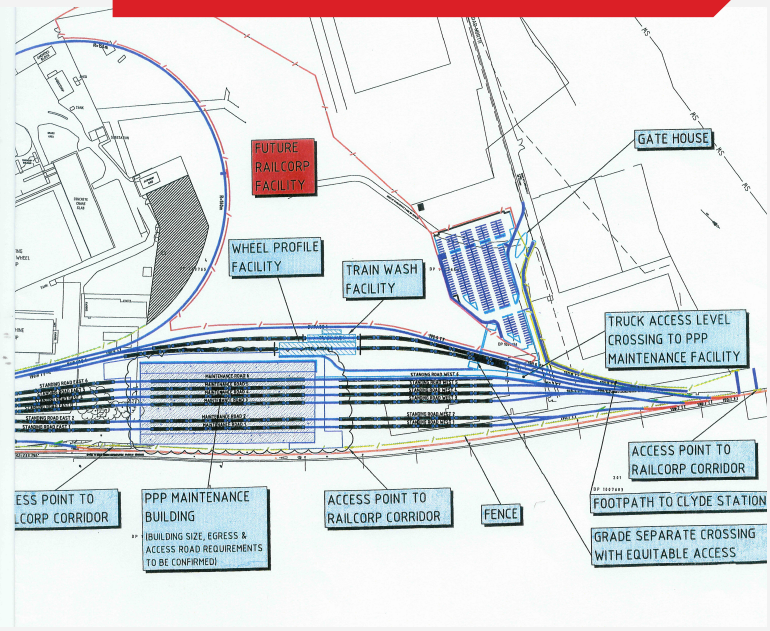
Based on the field work it is expected that filling, between about 0.5m and 5m depth, is underlying the proposed development. The filling is uncontrolled and variably compacted and could potentially experience unacceptable settlements and / or differential settlements over time. To minimise the potential settlements of the proposed structures and associated railway tracks and roads, ground techniques using a combination of HEIC and conventional plant was adopted. HEIC was used for the major part of site and conventional methods for tight areas where the HEIC machine was unable to traverse. HEIC was carried out at the bulk excavation level in areas of the existing uncontrolled fills.

Monitoring & Verification/QA

Intelligent Compaction Measurement was carried out to identify soft spots and settlement monitoring carried out to assess total differentials achieved as well as total average settlements across the site. An average of 353mm of settlement was recorded across the site with maximum and minimum settlements of 680mm and 160mm respectively. The ground response monitoring indicated a consistent stiffness across the site area after 70 surface coverage's. There appeared to be a very dense surface crust and the impact compactor took between 20-30 passes to punch through this dense crust hence the massive increase in average settlement from 20-30 passes.

The relative soil stiffness maps showed significant improvement with an average "g" value increase of 3.3 from 0-70 passes. The initial stiffness map showed the weaker areas and these weaker areas also showed where most settlement occurred and by 70 passes these weaker areas had stiffened up considerably giving the platform a more uniform profile at depth. The CPT's also indicated significant improvements in sub-grade stiffness from 0-70 passes.

Compaction Locations



Average of 353mm of settlement

Monitoring & Verification/QA cont.

The massive settlement achieved, and increase in stiffness values would suggest that there is close correlation between the ICM data signifying that there has been a huge increase in densities/stiffness over the area. A very dense surface crust was present, and the impact compactor required approximately 20–30 passes to penetrate it. Once breached, a marked increase in average settlement was observed.

Construction

The development will include an upgrade to the existing rail yard and build a new rail maintenance building, a wash plant, an underfloor profiling plant, 13km of associated rail tracks, a pedestrian footbridge, miscellaneous slabs and hard stands, fencing, signalling and lighting. The main maintenance building has dimensions of 74m x 184m. The building will be divided into north a maintenance area and south a storage area. Seven rail roads traverse the maintenance area from east to west.

Fastest and most economical solution

Summary

- Remediated 5.2m deep uncontrolled fill
- Stabilised 13km of rail formation.
- Achieved 353mm average surface settlement.
- Mitigate risk of differential settlement.
- Uniform stiffness via 70 passes.

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