

Case Study

application Subgrade Stabilization / Base Reinforcement
location Port of Long Beach, California
product Mirafi® HP570 Woven Geotextile

job owner Port of Long Beach
engineer Kleinfelder / Moffatt & Nichol
contractors Platinum Equipment Company / Manson Construction Company

TenCate develops and produces materials that function to increase performance, reduce costs and deliver measurable results by working with our customers to provide advanced solutions.

THE CHALLENGE

With a constantly growing demand to handle cargo coming from Asia, the Port of Long Beach needed to gain more container terminal capacity. The location of this project alone resonates its importance. The Port of Long Beach is the second busiest container seaport in the United States and combined with the adjacent Port of Los Angeles they represent the world's third busiest container cargo ports after Hong Kong and Singapore. This project consists of building a new wharf at Pier G to expand the International Transportation Service Container Terminal as part of the Mega-Terminal Development Plan to consolidate and redevelop existing Piers G and J to accommodate growing cargo volumes to year 2020. The plan includes increasing container terminal acreage through the construction of additional container off-loading wharfs, providing a paved container storage area behind the gantry cranes and to accommodate potential future on-dock rail-yards.

THE DESIGN

The design of this project began 30 years ago as a landfill operation for Pier G226 (see map). The landfill operation included the placement of hydraulic fill dredged from the harbor. The fill area was contained by a shoreline rock dike embankment. A soil surcharge was placed over the hydraulic fill to prepare the area for future development. In today's Pier G226 construction project of constructing an off-loading container terminal (to be labeled Pier G232), the design called for removal of the soil surcharge to wharf level and to convert the rock dike embankment to a seawall structure with 100 ft high gantry cranes supported on piles. The earthwork contractor, Platinum Equipment Inc., a subcontractor for Manson Construction Company removed several feet of the soil surcharge until waving and pumping occurred in the existing fill. The result was an unstable platform on which to construct the designed paved container storage area. The TenCate Geosynthetics distributor, Triumph Geosynthetics was working on the nearby Pier T project supplying Mirafi® 1100N geotextile and was asked to look for a solution for Pier G. Triumph provided various geosynthetic solutions for soil stabilization. The geotechnical engineer, Kleinfelder, a subconsultant to Moffatt & Nichol, determined that layers of fine silts and clays within the partially consolidated

hydraulic fill area resulted in soft sub-soil areas with poor drainage. The water problem in the fill was complicated with the fluctuation of tidal groundwater below the wharf area.

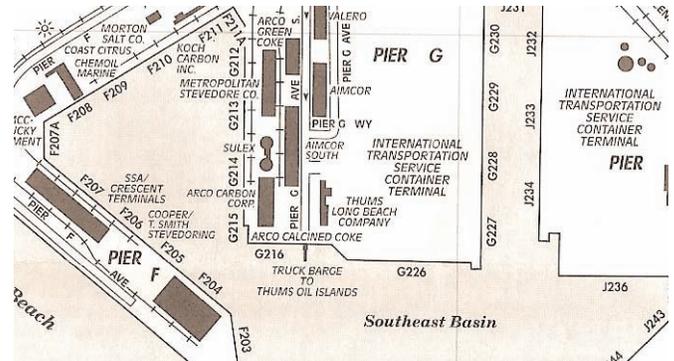
A common biaxial strength geogrid was first placed in a test area to provide subgrade support. Select fill was placed over the test area. However, waving and pumping of the fill continued in the test area. Another test area was performed using the Mirafi® HP570 Woven Geotextile. In this test area, the Mirafi® HP570 controlled the waving and pumping condition and allowed the placement of additional fill layers in a controlled manner. Kleinfelder provided a design with a lower layer of Mirafi® HP570 for the subgrade stabilization and an upper layer of Mirafi® HP570 for base reinforcement (see detail). A two foot thick drainage rock layer located between the 2 layers of Mirafi® HP570 providing a drainage channel for water flow to dissipate excess pore-water pressure.

THE CONSTRUCTION

Construction began with the placement of Mirafi® HP570 in the 130,000 SF wharf area behind the rock dike embankment. A three foot fabric overlap was used to ensure proper coverage due to settlements expected in the soft subgrade soils.



Container terminal at the Port of Long Beach



The project site is located at G226.

- Protective & Outdoor Fabrics
- Aerospace Composites
- Armour Composites
- Geosynthetics
- Industrial Fabrics
- Synthetic Grass

A two foot thick layer of two inch drainage rock was placed directly on the Mirafi® HP570 geotextile. The drain rock was pushed out over the fabric until the survey grade was reached.

An additional layer of Mirafi® HP570 geotextile was placed above the drainage rock. An 18-inch overlap for this layer was used due to the increased stability provided in the underlying stabilized fill. A 12-inch thick layer of crushed miscellaneous base was placed and compacted to 90% of specified compaction above the second layer of Mirafi® HP570. The upper cross section consists of 16-inch thick crushed aggregate base and 8-inch thick asphalt pavement. A total of 33,000 square yards of Mirafi® HP570 was delivered to this project.

THE PERFORMANCE

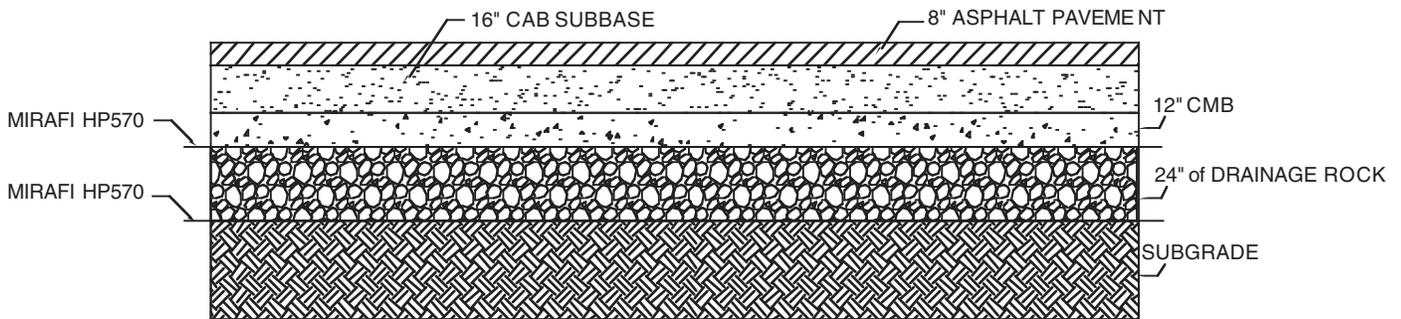
In preconstruction field trials, Mirafi® HP570 controlled the waving and pumping subgrade condition. Mirafi® HP570 Woven Geotextile was best suited in the construction of a stable platform for the paved container storage area on this project because it provided a separation layer between the fine grained subgrade materials and the drain rock while offering the filtration and flow characteristics similar to fine to coarse grained sand. Mirafi® HP570 also provided the high strength reinforcement characteristics necessary to stabilize the soft sub-soils found on this project site.



Above: Container storage area

Below left: The two layers of Mirafi® HP570 geotextile with 2 foot thick drainage rock

Below right: Placing the 15 foot wide rolls of Mirafi® HP570 geotextile



**DETAIL FOR
SUBGRADE STABILIZATION
NOT TO SCALE**

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