PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Sand Filter

High Strength Geotextile (Syntex®)
Water Authority, Apia, Samoa

Client: Samoa Water Authority
Date: October 2000

Samoa Water Authority (SWA) operates three treatment plants with slow sand filters as the final treatment step. These filters have been operational for about 10 years, but maintenance has been carried out at a rather poor standard leading to silting up of the sand and gravel layers at the bottom of the filters.

The pre-treatment units, sedimentation and up stream roughing filters of the treatment plants have already been improved in their performance through higher frequencies in sludge withdrawal and back washing procedures, but the sand filter performance was yet to achieve design performance.

For rehabilitation of the filters, it was suggested by engineers to remove sand and wash it and prevent further infiltration of fine silt material into the lower gravel layers. To achieve this, Syntex GHS 35/35 high strength woven geotextile was recommended to be placed on top of the gravel layer because of its high strength and superior hydraulic properties.

Syntex yarns are woven in a unique twill pattern to form a strong geotextile with excellent filtration properties. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.

Syntex GHS is manufactured in an ISO 9001 facility and tested by a GRI (Geosynthetics Research Institute) laboratory. In total, five Syntex sand filters of 28 meter diameter each were fabricated by Permathene Ltd in Auckland and installed at Alaoa treatment plant in Apia to prevent sand particles of < 0.15 mm infiltrating into the bottom gravel layer of the water treatment plant.

The filters are working as designed and has improved the filter performance considerably, but the real effect of this measure can only be seen on long term by the reduction of clogging of the bottom gravel layer.

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PROJECTS

SYNTEX® by Permathene

Soil Reinforcement

High Strength Geotextile (Syntex®)
Highway slip repair, Takaka Hill, Nelson

Client: Transit NZ
Date: July 2000

Due to the heavy rainfall and blockage of the culvert, a whole area was washed out which caused a slope failure along a 50 meter section of SH 60 on the Takaka Hill west of Nelson. Water caused the slope that supported the state highway to give way and become hazardous to road users.

Attempts to stabilise the slope and roadway using a combination of backfill, gabions and rock facing across the steepest and narrowest 20 m section of the washout were unsuccessful.

After thorough discussion with the Contractors, Syntex GHS 35/35 (35 kN x 35 kN) and GHS 70/70 (70 kN x 70 kN) High Strength Woven Geotextiles were approved for use in the construction of the Mechanical Stabilised Earth (MSE) wall.

Syntex High Strength Woven Geotextiles are designed for soil reinforcement. The heavy individual yarns are woven into a unique twill pattern forming a durable geotextile with superior hydraulic characteristics. These properties are considered ideal for the reinforcement of soft soils, steepened slopes, retaining walls, lagoon closures and lining support systems.

Syntex HS is manufactured in an ISO 9001 facility which maintains highest quality with its product tested by a GRI (Geosynthetics Research Institute) laboratory.

The area was first graded and smoothed, removing any rocks and debris. Two layers of AP 65 aggregate was placed using Syntex GHS 70/70 geotextiles to a depth of 150 mm. Then the first layer of Syntex GHS 35/35 geotextile was placed.

Once backfill was placed to the height required by the design (600 mm), Syntex 2x2 was laid over the compacted Onekaka Schist Sandy soil. The sequence was repeated until the wall reached its total height of 6 m.

Hydroseeding the wrapped face of the wall was suggested and a row of Poplar Poles was placed at the base to give additional protection from the UV exposure to the wrap around geotextile face.

The combination of the geotextile reinforcement and the hydroseeding of the face permanently repaired the slope, making SH 60 safe again. This project not only demonstrated equivalent performance to other solutions but was done at a much lower cost.

Philip Drummond, project Engineer, Excell Corporation Ltd, was pleased with the solution offered by Permathene Ltd.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Reinforcement

High Strength Geotextile (Syntex®)

Boat ramp, Beachlands, New Zealand

Client: Manukau City Council
Date: October 2001

The site for Beachland boat ramp was a low lying sandy area on the seacoast as part of the Sunkist Bay Reserve. The site subgrade was very weak with CBR values of less than one. There was a recent slope failure and because of the weak subgrade, low tyre pressure vehicles were used to clear the site.

An access road was required to be built and it was determined by a Permathene engineer that geosynthetic reinforcement would be needed to prevent sand waving and subgrade failure. The geosynthetic would need to resist separation during fill placement and have a high strength at low strain to prevent excessive subgrade deformation.

The contractor selected Syntex GHS 70/70 (70 kN x 70 kN)Woven High Strength Geotextiles based upon its excellent performance on similar projects.

Placement of the geotextile was made after the area was cleared and was placed directly over the sandy soil. 50 mm of GAP 40 fill was then placed over the geotextile and overlaid with 350 mm of GAP 100 using an 8 tonne digger. The result is that the site subgrade was successfully stabilised which allowed the movement of 22 Tonne trucks on this access road to do slip repair work.

Where soft subgrades are encountered, high performance geotextiles have proven to be a cost effective and technically appropriate construction method. The contractor, Roger Earthmoving Ltd was very satisfied with the results. The excess road was 4 m wide and 140 m long and was ready in a day to carry out the slip repair on site.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Stabilisation

Nonwoven Geotextile (Syntex®)
Street realignment, Mairangi Bay, New Zealand

Client: North Shore City Council
Date: 1999

In this project, Sidemouth Street was realigned with a reconfigured roundabout at the southern end to improve traffic flow and relieve congestion. Along Beach Road four thresholds (narrowing of the road/ kerb extensions) provide conveniently located pedestrian crossing points.

Subgrade was extremely weak with saturated fine grained silt and clayey soils with a CBR value less than 3. The consultant opted to install a lightweight nonwoven needlepunched geotextile on existing subgrade overlaid with GAP 60 to a depth of 600 mm. On top of this 150 mm of M4 was placed.

Syntex GNP A1 (Strength Class A) nonwoven, needlepunched, staple fibre geotextile was used as the lightweight subgrade separation fabric to improve bearing capacity.

Laboratory study demonstrated that Syntex geotextiles offer substantial improvement to the performance of pavements constructed over weak and moderate subgrade. This improvement is attributed to the separation capabilities of the Syntex geotextiles and their ability to prevent the development of a transition layer (intermixing layer).

Common failure of secondary roads, is often due to differential settlement and premature rutting. Also, subgrade fines migrate into the base course layer, or aggregate from the base course penetrates into the soft subgrade. This jeopardises structural capacities and compromises drainage capabilities of the pavement system. Thus accelerating the rutting failure mode and leading to a reduction in the pavement service life.

When a Syntex geotextile is placed at the interface between the base course and a soft subgrade, contamination is avoided and a transition layer may not form. Annual cost savings ranging from 5 to 15 percent can be expected when using an appropriate separation geotextile with low volume paved roads.

Early indications are that the road is performing well and there is tremendous improvement in the bearing capacity, says James Walsh, Contracts Engineer of Blackmor Earthmoving Contractors.

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PROJECTS

SYNTEX® by Permathene

Pavement Reinforcing

Asphalt Overlay (Pavedry®)
City street, Dunedin, New Zealand

Client: Dunedin City Council
Date: April 2000

As part of Dunedin City Council's annual shape correction programme, Burlington Street, an inner city street was identified for repair and re-paving work. Burlington Street is a 6 m wide street that is used as an important link between High Street and Moray Place with approximately 6000 vehicles passing per day.

Geotechnical test reports showed that there was no underlying subgrade problem, however the surface was asphalt that had oxidised and cracked over time. It was decided by City Consultants to lay Pavedry asphalt overlay fabric over the existing surface, completed by an asphalt levelling course and a 38 mm asphalt overlay. Pavedry asphalt overlay fabric increases the pavement life, retards reflective cracking and reduces maintenance costs.
Pavedry is a nonwoven, needlepunched, polypropylene, staple fibre geotextile specifically engineered for asphalt overlays. As the polypropylene has an affinity for petroleum products, there is a considerable migration of tack coat into the yarns. This creates an inert, laminated monolithic composite that has been proven to delay resurfacing years longer than conventional re-paving techniques.

The contractor Fulton Hogan of Dunedin installed Pavedry asphalt overlay fabric with the calendered side up using an appropriate installation device. All the cracks (> 6.3 mm wide) were filled with an appropriate crack sealant and the tack coat was sprayed approximately 150 mm wider than the width of the paving fabric. All seams were overlapped 75 mm along roll edges and 150 mm at roll ends.

John Sutherland, Project Engineer, City Consultants says that "it has been 10 months since Pavedry was laid and no cracking from the existing surface has occurred" which proves that Pavedry asphalt overlay fabric is a most suitable and economical interlayer option for asphalt overlays.

Whether designing an erosion control plan, constructing a roadway or planning a subsurface drainage system, Syntex needlepunched nonwoven geotextiles are certain to benefit your project.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Stabilisation

Nonwoven Geotextile (Syntex®)
Highway embankments, Yamuna River, India

Client: Noida Toll Bridge Company, New Delhi
Date: April 1999

This major Indian project is centred on the construction of an 8 lane bridge across the Yamuna river linking Delhi & Noida in New Delhi, India. Noida is a prosperous industrial town on the periphery of East Delhi currently experiencing rapid population growth. The Yamuna river flows between Noida and New Delhi and all commuter traffic from Noida must use an existing 4 lane bridge in a neighbouring town which links East Delhi with New Delhi. In peak hours, it takes more than an hour to travel from Noida to New Delhi or vice versa.

The new 8 lane bridge will reduce traffic congestion during peak hours between Noida and New Delhi. The whole project has been awarded by the Noida Toll Bridge Co, New Delhi to M/s Mitsui Marubeni Corporation, a Japanese Company, who have sub-contracted the work of approaches to the bridge to Oriental Structural Engineers Ltd, New Delhi and 8 lane main bridge work to M/s Gammon (India) Ltd, New Delhi.

Oriental Structural Engineers Ltd is responsible for the construction of huge sand embankments by dredging sand from the Yamuna riverbed. The contract includes hydraulic filling, construction of slab culverts, pipe culverts, retaining wall construction and protection work along the roadway, or guide bund.

The scope of work also includes the construction of road crust protection works consisting of gabions filled with stone boulders and placed over Syntex GNP B1 (Strength Class B) nonwoven geotextile on slopes and apron.

The embankments will also be protected with Syntex GNP B1 covering and gabions. Syntex GNP B1 nonwoven geotextile was supplied by Permathene Ltd of New Zealand.

The total cost of work awarded to Oriental Structural Engineers Ltd is NZD 34.8 million.

The duration of the job was 24 months. This is one of the largest bridge projects in India and Permathene is pleased to supply the total geotextiles (over 250,000 m^2) required for this project.

Whether designing an erosion control plan, constructing a roadway or planning a subsurface drainage system, Syntex needlepunched nonwoven geotextiles are certain to benefit your project.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Stabilisation

Nonwoven Geotextile (Syntex®)
Hockey field, Hamilton, New Zealand

Client: Waikato Hockey Association
Date: May 2000

Syntex GNP 115 (Filtration) nonwoven geotextile was used as a solution to separate weak pumping subgrade and clean gravel base. The actual subgrade CBR achieved on site was seven. Syntex nonwoven geotextile was laid on the subgrade which enabled the subbase and base course to remain clean and maintain its strength, with the primary function to allow water to pass quickly and lower pore pressure build up in the subgrade.

The total area of approximately 6000 m^2 was properly compacted and covered with Syntex GNP 115 before putting 150 mm of clean gravel drainage blanket overlaid with GAP 40 to a depth of 125 mm. After proper compaction, 25 mm of open graded asphalt was spread on the top before finally placing the Astro Turf on it.

By placing Syntex GNP 115, which is a light grade fabric, at the interface between the subbase and a soft subgrade, contamination was avoided and bearing capacity was improved.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Geomembrane Protection

Nonwoven Geotextile (Syntex®)
Rotorua Landfill, New Zealand

Client: Rotorua District Council
Date: February 1999

Permathene was involved in designing the geomembrane liner and cushioning fabric with Worley Consultants for this project. We also assisted with project specification and the QC procedures.

Syntex GNP E1 (Strength Class E) nonwoven geotextile was recommended by Permathene to go on top of the 1.5mm HDPE liner. By virtue of its chemical composition, molecular structure and thermodynamic properties, polypropylene is one of the most resistant raw materials known today.

Syntex GNP E1 has been specifically designed for use in landfill or waste disposal facilities. United States Environmental Protection Agency (EPA) 9090 accelerated testing performed on this product has demonstrated an excellent chemical compatibility with landfill leachate. It is highly resistant to puncture, impact and abrasion, which greatly reduces the potential damage from sharp objects during and long after the construction process.

In a separate study, properly stabilised and buried Syntex polypropylene geotextiles have been estimated to have a functional longevity of nearly 200 years in an oceanic or marine application.

At present, nonwoven polypropylene geotextiles are used in more than 80% of all waste containment applications.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Stabilisation

Nonwoven Geotextile (Syntex®)

Dairy factory waste water channel, Te Rapa, New Zealand

Client: Te Rapa Dairy Company
Date: February 1999

The new Powder Plant, an expansion of the Te Rapa Dairy Factory, is the largest milk powder plant in the world. The project centred around the construction of a new drier building and drier plant. Additional contracts resulting from the expansion included the construction of a new underpass off State Highway 1, wastewater treatment works, roading, drainage, and various electrical and mechanical installations.

Permathene Ltd supplied Syntex GNP D1 (Strength Class D) nonwoven geotextile for use in 2 contracts associated with the expansion work: the Main Civil Contract, awarded to Pemberton Construction Ltd of Hamilton which included construction of the stormwater diversion pond and the Waikato River Outfall Contract, awarded to McConnell Dowell Ltd. of Tauranga with Pemberton Construction as subcontractor on the gully. John Crawford and Alan Muller of Opus International Consultants Ltd, Hamilton oversaw these contracts.

The Stormwater Diversion Pond, 57 m long and 41 m across with a depth of 4.5 m was lined with Syntex GNP D1 before putting a Flexible Membrane Liner (FML) on top of it. FML are generally prone to damage from even isolated and infrequent protrusions in the subgrade onto which they are deployed. Syntex GNP D1 provides security to FML against damage during installation and throughout the life of the facility. It also helps to increase the puncture resistance of the FML and if properly stabilised and buried, Syntex Nonwoven Geotextiles are expected to last up to 200 years.

The laying of the 6 m wide stormwater channel and 2 m wide treated wastewater gully necessitated construction over a very soft swamp. Site investigations indicated the proposed subgrade was comprised of black topsoil with large rotting tree stumps and logs, underlain by extensive peat deposits. David Ward, Contracts Manager of Pemberton Construction Ltd, described the site as marshy and difficult to walk on. A 1 m deep "V Drain" was constructed and filled with metal. Syntex GNP D1 was laid on top of the metal, covered with 300-400 mm of rip rap (100-300 mm size aggregates) and levelled.

Syntex GNP D1 acts as a "separation" layer stopping the rip rap material from pushing down into the soft wet subgrade and preventing mud from contaminating the clean aggregate. This gives a more stable, wearing and sturdy solution for the drainage problems.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Stabilisation

Nonwoven Geotextile (Syntex®)
Highway slip repair, Stockman Hill, New Zealand

Consultants: Opus International
Date: March 1999

In July 1998 slip occurred causing 120 m of highway to slide 6 m down the slope. The SH3, about 40 km South of Te Kuiti was closed for 5 days as contractors removed unstable ground and rebuilt a one way track through the site. A second slip occurred during record rainfall in October 1998, and the size and nature of this slip prompted Transit NZ to immediately order widening and a detailed design was undertaken by Opus.

In order to construct permanent repair works, SH3 was diverted via Totoro Road and Aria Road from Piopio, which required widening and upgrading to a suitable standard before the detour could be opened and work on Stockman's hill commenced. "The final cost of reconstruction including the detour route is expected to be approximately NZD 7 million" as per Mr. Nigel D'Ath, Project Manager, Opus International Consultants.

This contract was let to Fulton Hogan in December 1998 and is expected to be completed by June 1999. In order to stabilise the highway, various sections were dug out by the contractor at the unstable areas immediately north of the main slip sites and the drainage pipes were later installed, covered with the drainage aggregate wrapped in Syntex GNP B1 (Strength Class B) nonwoven geotextiles. The typical average depth of the subsoil drainage trenches was 5 m, having concrete base and firm sides. These drainage pipes were installed under a new road foundation.

Syntex GNP B1 is a medium weight nonwoven geotextile which acts as an excellent filter, allowing subsurface water to pass into the drainage core while preventing adjacent soil from clogging the system.

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Stabilisation

Woven Geotextile (Syntex®)
Road construction, Manukau, New Zealand

Client: Totara Mews
Date: April 1999

Syntex GW 165 woven geotextile was used as a base for road construction in a new subdivision development in Manukau. The clayey subgrade was properly compacted and a layer of Syntex GW 165 was laid directly over the subgrade. This was overlaid by approximately 150-300 mm GAP 40 base layer and 150 mm of concrete. The "separation" function of this economical high strength woven geotextile prevented the aggregate from becoming contaminated with the subgrade soils below.

A soft subgrade covered with the appropriate grade Syntex woven geotextile stabilises the ground by spreading applied loads over a wider foundation, reducing rut depths and preventing aggregate contamination. This reduces maintenance costs, improves roadway life and permits unrestricted flow of traffic.

Syntex woven geotextiles are extruded and slit from polypropylene film which weave individual yarns into geotextiles featuring high tensile strengths at low elongation (high tensile modulus).

The installation was simple and quickly achieved as follows: The subgrade was properly compacted, depressions and holes were filled and large stones, limbs and other debris were removed prior to placement to prevent fabric damage from tearing or puncturing during stone placement.

The Syntex GW 165 was rolled out loosely, without wrinkles and folds and placed in direct contact with the soil. The geotextile was covered with approximately 150 to 300 mm of loosely placed GAP 40 mm aggregate prior to compaction. The aggregate was back bladed into place to form a slight mount in the middle and to extend out beyond the fence line. This was then rolled with a vibrating roller before putting 150 mm of concrete surface layer on to it.

This subdivision will be completed in April 1999 and as per Mr. Vince Kirrane, Managing Director - Totara Mews Ltd, "the decision to lay Syntex GW 165 has proved to be very successful with a ground movement reduced to nil over a short period of time."

PERMATHENE Earth Solutions

PROJECTS

SYNTEX® by Permathene

Soil Stabilisation

Woven Geotextile (Syntex®)
Industrial warehouse development, New Zealand

Client: Calder Stewart Industries, Milton
Date: September 1999

An area of approximately 25,000 m^2 with a subgrade of sand overlaid with about 3 meters of volcanic ash deposits, was selected to build industrial warehouses. The minimum subgrade CBR was determined as 5 and the earthwork consultants decided to stabilise the ground with Syntex GW 165, a medium weight woven roading geotextile, at the interface of subgrade and subsoil.

For over 25 years, woven geotextiles have been utilised in similar application involving the reinforcement and stabilisation of soft subgrade soils.

Syntex GW 165 was laid on the existing volcanic ash subgrade before putting 300 mm of gravel rock overlaid with GAP 60 to a depth of 100 mm. After proper compaction, 40 mm of hot mix was spread on the top. Over 17,000 m^2 of geotextile was successfully installed on this site.

The geotextile was quickly and easily installed because of wide and long rolls which minimised waste and covered large areas in short periods of time.

By unrolling a high modulus Syntex GW 165 woven geotextile directly on the subgrade during construction, aggregate is permanently separated from finer soils below.

The choice of Syntex GW 165 woven geotextile as a means of increasing the stability and preventing aggregate contamination was determined to be the optimum solution to the problem.

Disclaimer

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