



**GEOSYSTEMS**

**Presto Geoweb®**  
**By: Ianna Gold Tech Guyana**  
**Kaituma Road Overview**

*Jeremy A McConnell, P.E.*

*Gil Peretz*

# Geoweb System

## The Container

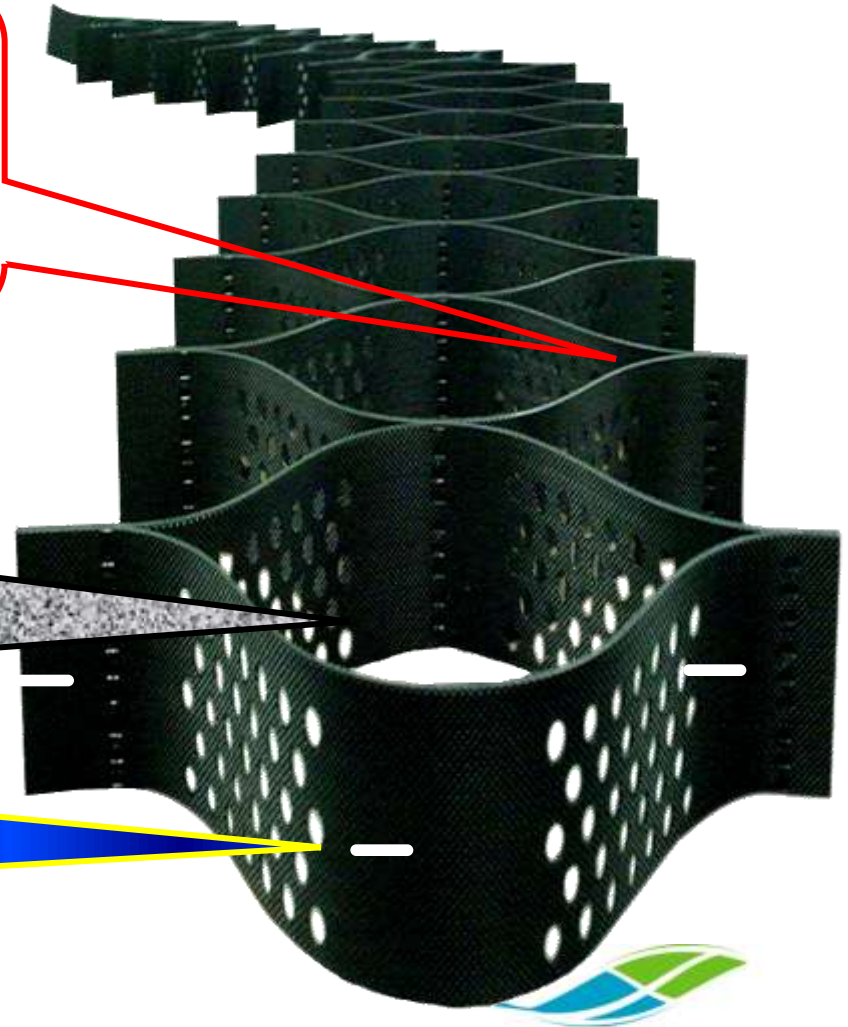
30V6 (Mid-cell)  
6 inches depth  
2.6 Meters Wide  
8.3 Meter Section Length

## The Content

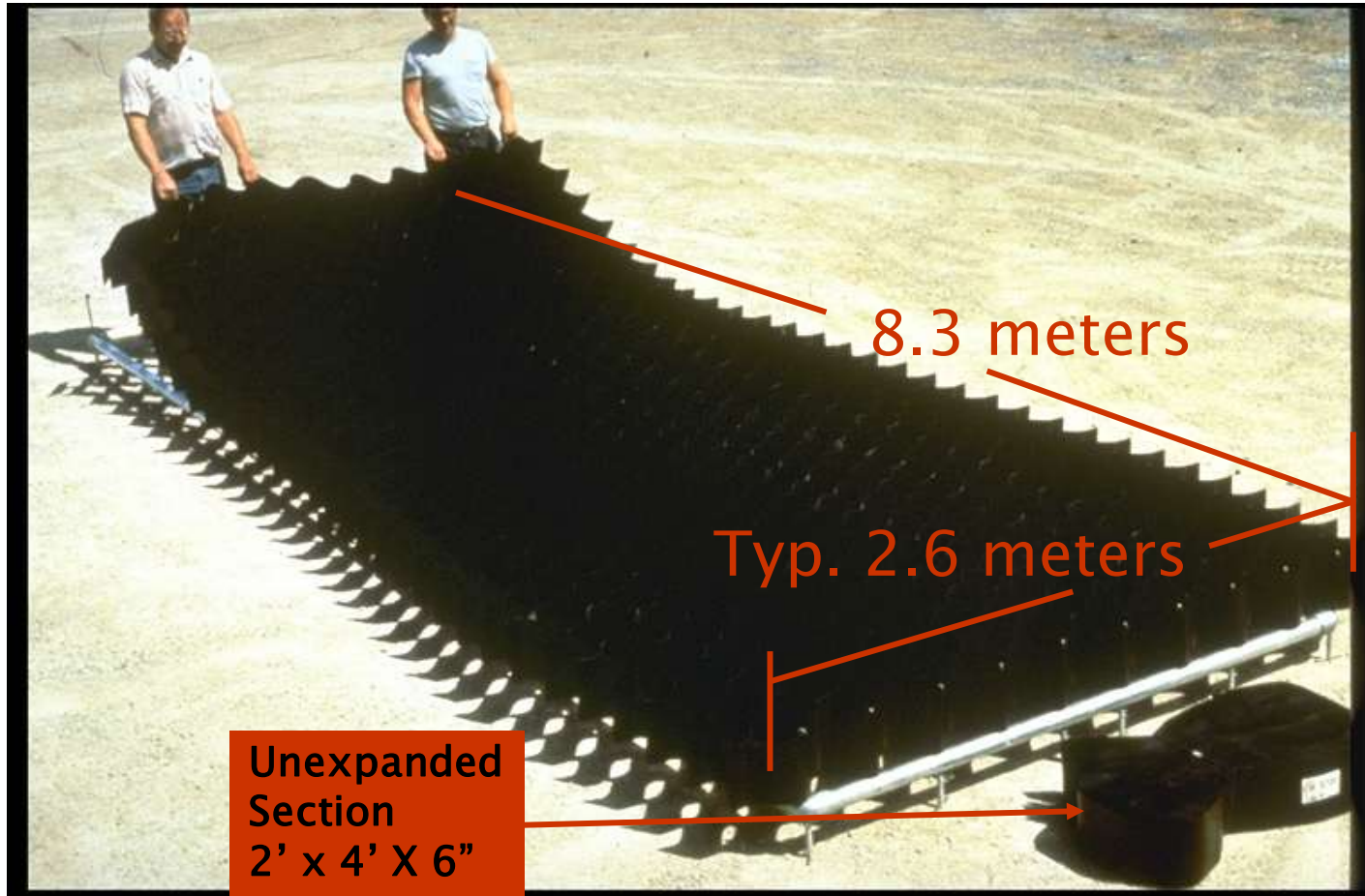
Aggregates  
Concrete  
Engineered Infill

## Other Components

Woven Geotextile  
ATRA® Keys



# Geoweb System



# KAITUMA ROAD ASSESSMENT



# KAITUMA ROAD ASSESSMENT

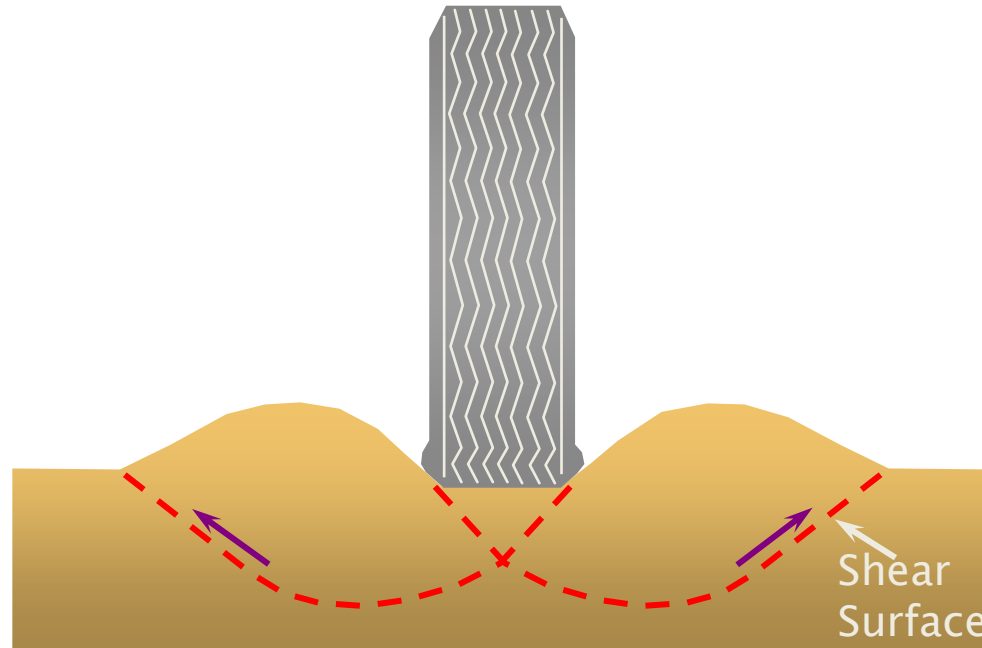
## The Problem?

Saturated  
residual soil  
mires  
equipment  
on Kaituma  
Road.



**GEOSYSTEMS**

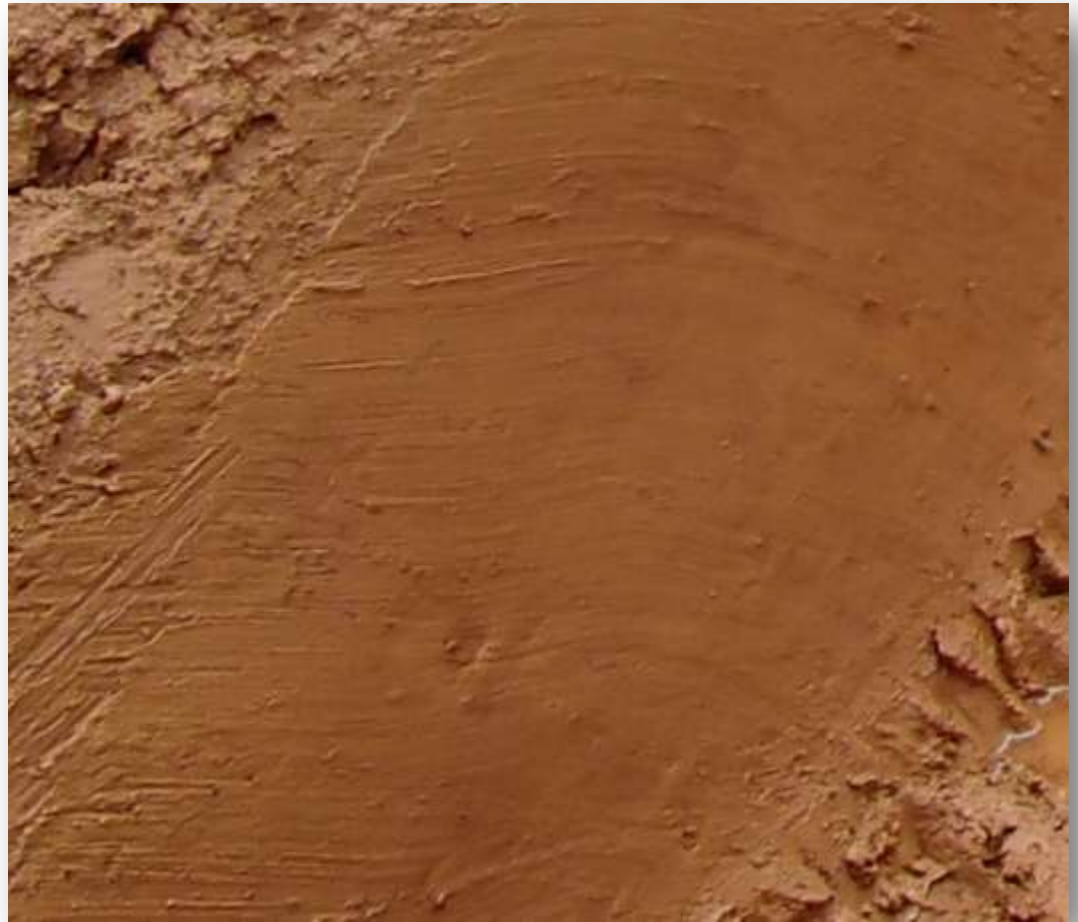
# Bearing Capacity Failure Mechanism



## RESIDUAL SOIL

### **SILTY CLAY WITH SAND AND GRAVEL –**

**Susceptible to strength loss when saturated. This saturation starts from the surface and drives downward under traffic.**



# KAITUMA ROAD ASSESSMENT

## DRAINAGE

**WATER PONDS AT  
LOW ELEVATIONS  
RESULTING FROM  
RAINWATER AT –**

**Valleys**

**Roadway Cuts**

**Cross Drainage**



# KAITUMA ROAD ASSESSMENT

## MAINTENANCE

**Maintenance costs average \$26.9M per year per bad spot (average of 450 m per bad spot).**



**GEO SYSTEMS**

# KAITUMA ROAD ASSESSMENT

**Total Length of Road to Maintain:**

**51 kilometers**

**Average Length of Road Requiring Overexcavation and Reconstruction (Bad Spots):**

**7.5 kilometers**



# KAITUMA ROAD ASSESSMENT

## Maintenance Equipment Required:

- 1 Excavator (at location)
- 1 Bulldozer (at location)
- 1 Excavator (at borrow pit)
- 2 - 30 Ton Haul Trucks
- 1 Grader

**Total:**

## Equipment/Operator, Fuel, Maintenance Costs

\$1,120,000 per day

\$1,120,000 per day

\$1,120,000 per day

\$2,240,000 per day

\$1,120,000 per day

**\$6,720,000 per day**

# KAITUMA ROAD ASSESSMENT

## Maintenance Requires 4 Days On Average:

- 1 Excavator (at location)
- 1 Bulldozer (at location)
- 1 Excavator (at borrow pit)
- 2 - 30 Ton Haul Trucks
- 1 Grader

## Total:

## Equipment/Operator, Fuel, Maintenance Costs:

- \$4,480,000 per location
- \$4,480,000 per location
- \$4,480,000 per location
- \$8,960,000 per location
- \$4,480,000 per location

**\$26,880,000 per location**

# KAITUMA ROAD ASSESSMENT

**Average Length of Road Requiring Over excavation and Reconstruction (Bad Spots):**

**7,500 meters**

**Average Length of Repair Locations:**

**450 meters**



**Average Number of Repair Locations: 17 locations**

# KAITUMA ROAD ASSESSMENT

**Annual Cost of Over  
Excavation and  
Reconstruction at Bad  
Spots:**

**17 locations x  
\$26,880,000 per  
location**

**=**

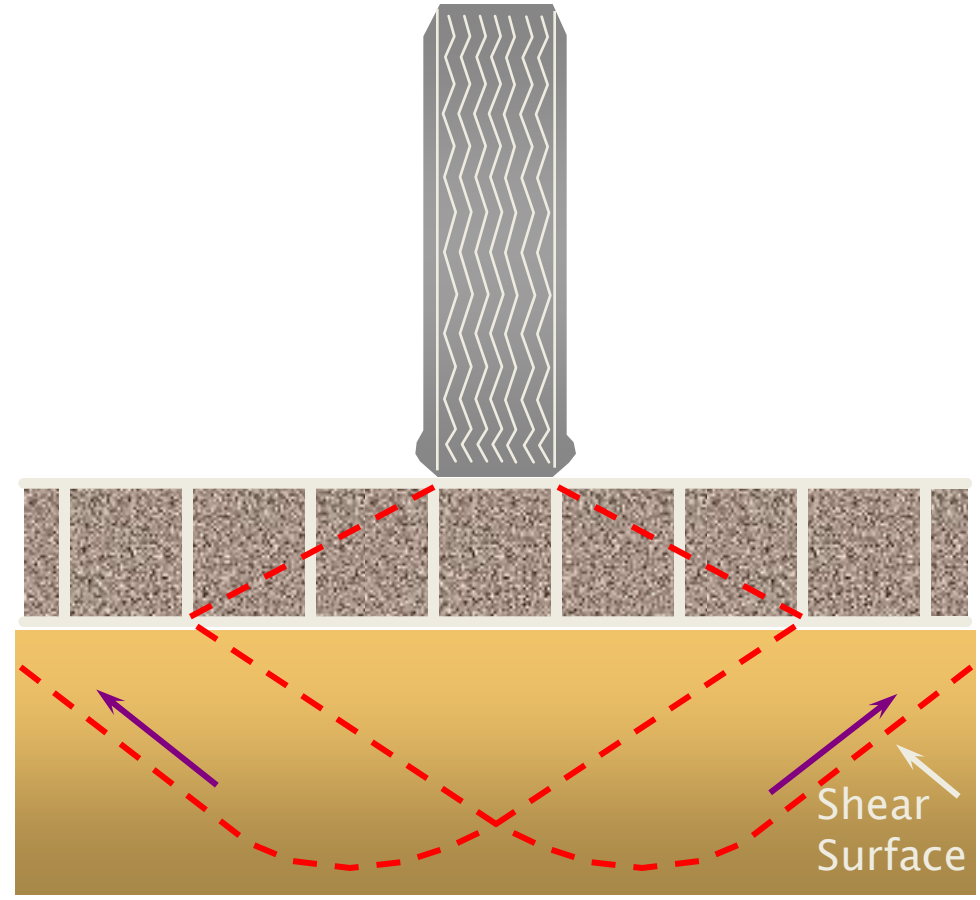
**\$456,960,000**



# **BENEFIT OUTCOMES AFTER APPLYING GEOWEB® HAUL ROAD SYSTEM**

An engineering case

# Failure Prevention Mechanism



# Geoweb® Haul Road System

## The Solution?

A GEOWEB-reinforced section of road that will only require routine grading after **4 years**.



# Geoweb® Haul Road System

## BENEFITS FOR GGMC

**ALLOWS STABILIZATION OF LATERITE** – Increases the apparent cohesion of laterite confined in cells. GEOWEB also reinforces the shear zone.

**REDUCES DEEP RUT AND POTHOLE MAINTENANCE** – Eliminates lateral movement of materials within the cell structure and strengthening the fill where it needs it, at the surface!

**RESISTS EFFECTS OF SURFACE FLOW** – Containerization of laterite will minimize rills and gullies at the road surface.

**THE SUBGRADE “FEELS” LESS STRESS THAN WITH OTHER METHODS** – Reduces the amount of stress that is applied to weak sub-grades by load distribution. This prolongs surface life.



# Geoweb® Haul Road System

## General Haul Road Evaluation Design Assumptions:

Traffic Details: 5,000 lb tire load, 100 psi tire pressure

Type of Sub Grade Soil: Clayey or Silty Sand, Saturated

Sub Grade Strength: CBR = 1.5%

Desired Final Wearing Surface: Laterite

Local Infill is laterite or mine tailings.

Subgrade replacement at deeply rutted locations could use the local clayey material, laterite or the silty sand with gravel, cobbles, and boulders (“pit run,” or gravel).



**GEOSYSTEMS**

# Geoweb® Haul Road System

## Required Results and Benefits?

*Less Overexcavation and Reconstruction,*

*Reduced equipment needed for routine  
maintenance*

*Increased reliability of construction estimate, and*

*MORE EFFICIENT USE OF MAINTENANCE BUDGET.*

# Geoweb® Haul Road System



<http://www.goodyear.com>



## RL-4B(E-4)

Tire Size: 40.00R57

150-level radial rock tire specifically designed with a unique wider, flatter tread arc width resulting in longer, more even wear.

This 150-level radial rock tire is specifically designed with a unique wider, flatter tread arc width which results in a longer, more even wearing tire. This tire is available in multiple tread compounds: high speed, standard haulage and abrasion resistance. The radial construction guarantees better fuel economy, improved treadwear and a softer ride.

Available in ply ratings: \*\*  
Available locations: North America, Asia / Australia

### Features

- 150-Level tread depth – 50% deeper than standard E-3
- High tensile steel belt package
- Radial construction
- Solid centerline section
- Tire available in multiple tread compounds
- Wide, flat tread radius

### Benefits

- Extra tread for long wear
- Impact resistant
- Better fuel economy, softer ride and improved treadwear
- Ideal for high torque applications, longer wear and smooth ride
- Type 2 available for long high speed application, Type 3 available for intermittent high speed application, Type 4 available for standard haulage application and Type 6 available for abrasion resistance
- Longer even treadlife


## Tire Data and Specifications

Rim Width & Flange	INFLATED DIMENSIONS						LOADED DIMENSIONS												
	Min. Dual Spacing		Overall Width		Overall Diameter		Load Seat & Growth		Static Load Rad		Revol Per	Gross Contact Area		Tire Volume		Tread Depth			
	in	mm	in	mm	in	mm	in	mm	in	mm	mi	km	in <sup>2</sup>	cm <sup>2</sup>	gal	lts	in	mm	in
29.00-6.0	53.1	1349	44.50	1130.00	140.50	3569.00	50.7	1287	62.4	1585	150	93	1611	10394	1488.3	5633	108	85	86

## Inflation Tables

30 MPH (50 km/h) MAXIMUM SPEED OFF-THE-ROAD HAULAGE SERVICE

PSI	65	68	73	78	80	83	87	91	94	98	102
KPA	449	470	500	534	552	571	600	628	650	676	700
LBS	8930	9630*	10200	10700	11000	11500	11700	12000	12300	12600	13200**
KG	4250	4350*	4650	4870	5000	5150	5300	5450	5600	5800	6000**

 <b>PRESTO GEOSYSTEMS</b>				<b>GENUINE GEOWEB® CELLULAR CONFINEMENT</b>	
Correlation of Subgrade Soil Strength Parameters for Cohesive Soils (Fine-Grained)					
California Bearing Ratio	Undrained Shear Strength*	Hand Penetrometer Readings	Standard Penetration Resistance	Field Identification / Visual	
CBR (%)	C <sub>u</sub> (psi)	P <sub>q</sub> (tsf)	SPT (blows/ft)		
< 0.4	< 1.7	< 0.25	< 2	<b>Very Soft</b> (extruded between fingers when squeezed). Man standing sinks >3 inches	
0.4 – 0.8	1.7 – 3.5	0.25 – 0.50	2 – 4	<b>Soft</b> (molded by light finger pressure) Man walking sinks 2-3 inches	
0.8 – 1.6	3.5 – 6.9	0.50 – 1.0	4 – 8	<b>Medium</b> (molded by strong finger pressure) Man walking sinks 1 inch	
1.6 – 3.2	6.9 – 13.9	1.0 – 2.0	8 – 15	<b>Stiff</b> (readily indented by thumb but not penetrated with great effort) Pick-up ruts ½-1 inch	
3.2 – 6.4	13.9 – 27.7	2.0 – 4.0	15 – 30	<b>Very Stiff</b> (readily indented by thumb) Loaded dump truck ruts 1-3 inches	
> 6.4	> 27.7	> 4.0	> 30	<b>Hard</b> (indented with difficulty by thumbnail) Loaded dump truck no ruts	



**GEOSYSTEMS**

# Geoweb® Haul Road System

## Bearing Capacity Calculation (AASHTO)

Allowable Stress on Subgrade w/o Geoweb =  $N \times C_u$

Allowable Stress on Subgrade w/Geoweb =  $N \times C_u + \sigma_r$

### Where

N = Bearing Capacity Coefficient (Typical Values)

N = 2.8 for Normal Road (US Forest Service)

N = 5 to 6 for Geotextile

N = 6.2 for Geogrid

$C_u$  = Undrained Shear Strength of Subgrade

$\sigma_r$  = Increase in Allowable Stress due to Geoweb

# Geoweb® Haul Road System

$$\sigma_r = 2 \left( \frac{H}{D} \right) \sigma_{average} \tan r\phi$$

Developed from empirical sources, where:

$\sigma_r$  = Increase in Allowable Stress due to Geoweb

H = Cell Height

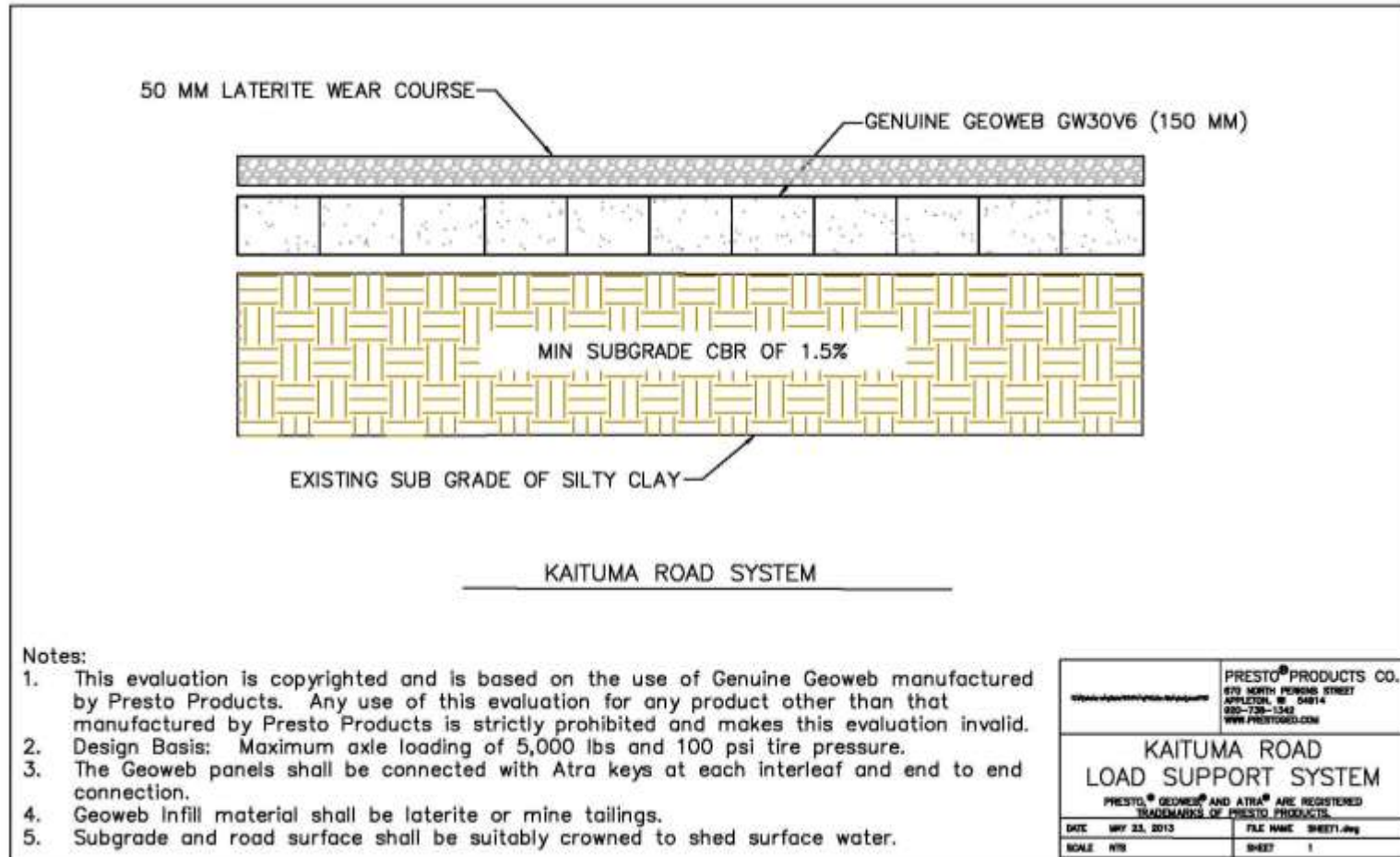
D = Cell Effective Diameter

$\sigma_{average}$  = Avg Horizontal Stress =  $(\sigma_{top} + \sigma_{bottom}) / 2$

r = Cell-Wall / Infill-Material Peak Friction Angle Ratio

$\phi$  = Angle of Internal Friction of the Infill Material

# Geoweb® Haul Road System



# Geoweb® Haul Road System

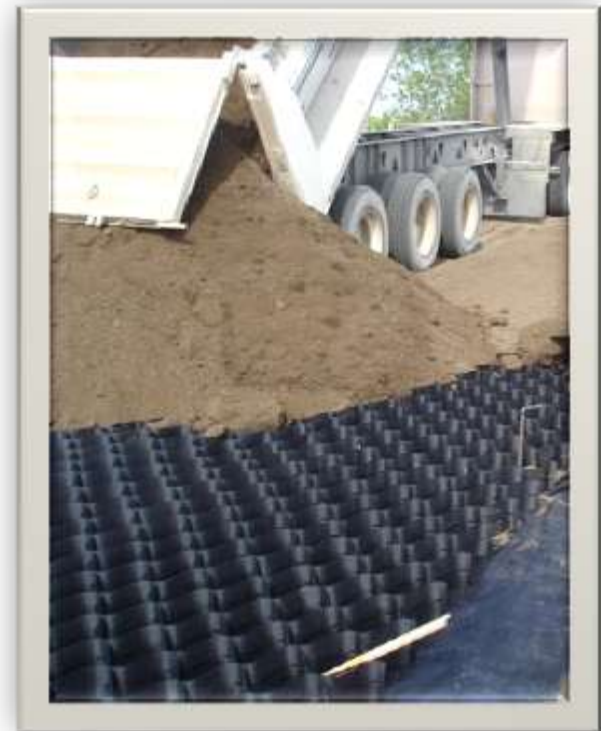
## LOW-STRENGTH SUBGRADE SOLUTION

1.5% CBR Subgrade

Laterite Infill

Woven Geotextile

Subgrade Preparation



# Geoweb® Haul Road System

## PROPOSED INFILL

**LATERITE** – Residual rock-like material that rips, excavates, and breaks down into a clayey sand, with gravel.

**Selected mining tailings can also work!**



# Geoweb® Haul Road System

Proposed GEOWEB Road Section Requires:	Estimated GEOWEB Costs (Based on 7.5 kilometers of repairs):
6" GEOWEB 30V6	\$75,000,000
GEOWEB Installation	\$600,000
GEOWEB Crew Accommodations	\$720,000
Woven Geotextile	\$11,250,000
<b>Total for 7.5 km:</b>	<b>\$87,570,000</b>

This Cost Applies Only to Direct Application of the GEOWEB,  
filling costs are not included.

# Geoweb® Road System

<b>Annual Cost of Maintenance Before GEOWEB (51 kilometers):</b>	<b>Cost of GEOWEB material and installation (7.5 kilometers):</b>
<b>\$456,960,000</b>	<b>\$87,570,000</b>
<b>Annual Cost Attributable to Major Repair of Bad Locations (7.5 kilometers):</b>	<b>Annual Cost of Routine Road Grading at GEOWEB installation (7.5 kilometers):</b>
<b>\$425,600,000</b>	<b>\$31,360,000</b>

# Geoweb® Haul Road System

## Benefits – Maintenance

Road Maintenance Reduces  
\$425,600,000 per year

Decreased Vehicle  
Maintenance



# Geoweb® Haul Road System

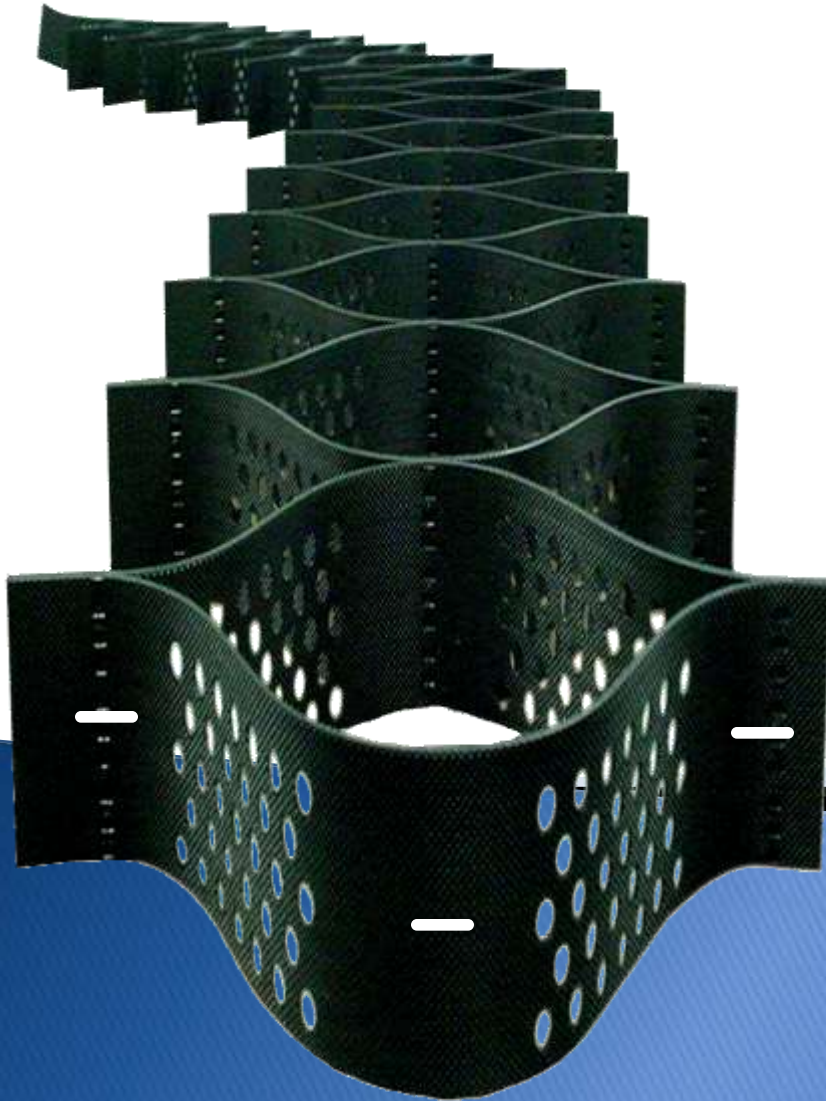


**Maxus Energy – Ecuador**

# Geoweb® Road System



**Maxus Energy – Ecuador**



# HAUL ROADS A CASE STUDY

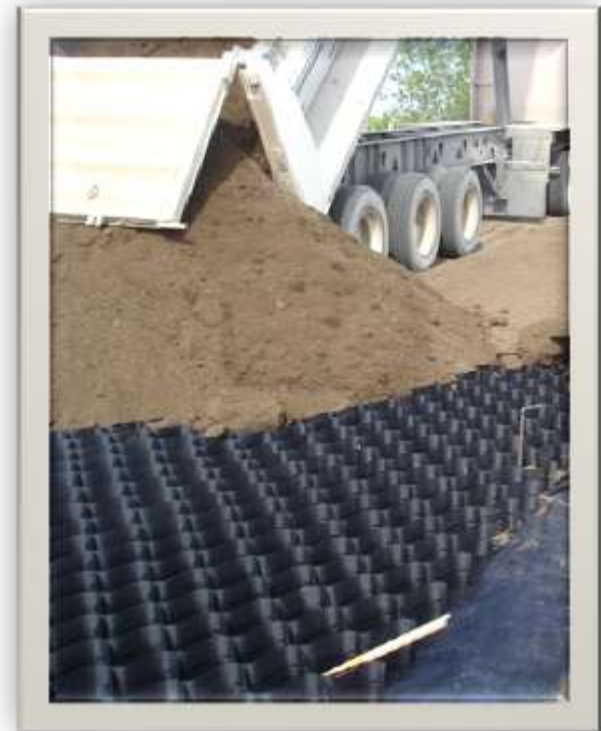
# Geoweb® Canadian Case Study

## LOW-STRENGTH SUBGRADE SOLUTION – CANADA

1.5% CBR Subgrade (Clay and Muskeg)

Reject Sand Available

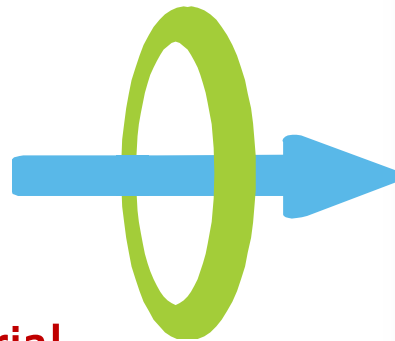
Other Aggregates Remote and Expensive to Obtain



# Geoweb® Canadian Case Study

**ENGINEERED SOLUTION!**

**4 YEARS – NO GRADING!**



Devon Construction  
Procurement Manager–

**“We did not like the material,  
we loved it. The roads have  
been performing way above  
our highest expectations.”**



# Geoweb® Canadian Case Study



**GEO SYSTEMS**

# Geoweb® Canadian Case Study



**GEO SYSTEMS**

# Geoweb® Canadian Case Study



# Geoweb® Road System



**GEO SYSTEMS**

# Presto Geosystems Ianna Gold Tech THANK YOU!

[www.prestogeo.com](http://www.prestogeo.com)

[jeremy.mcconnell@prestogeo.com](mailto:jeremy.mcconnell@prestogeo.com)

[gilp@its202.com](mailto:gilp@its202.com) 600-5320