
Carretera
Fernando Belaunde Terry
Campanilla-Pto Pizana
W91278-04-C-0011
ANDRADE GUTIERREZ
Construtora Andrade Gutierrez SA
USAID
MTC

Peru Road Upgrade Project

U.S. Army Corps of Engineers
Mobile District
Latin America Area Office

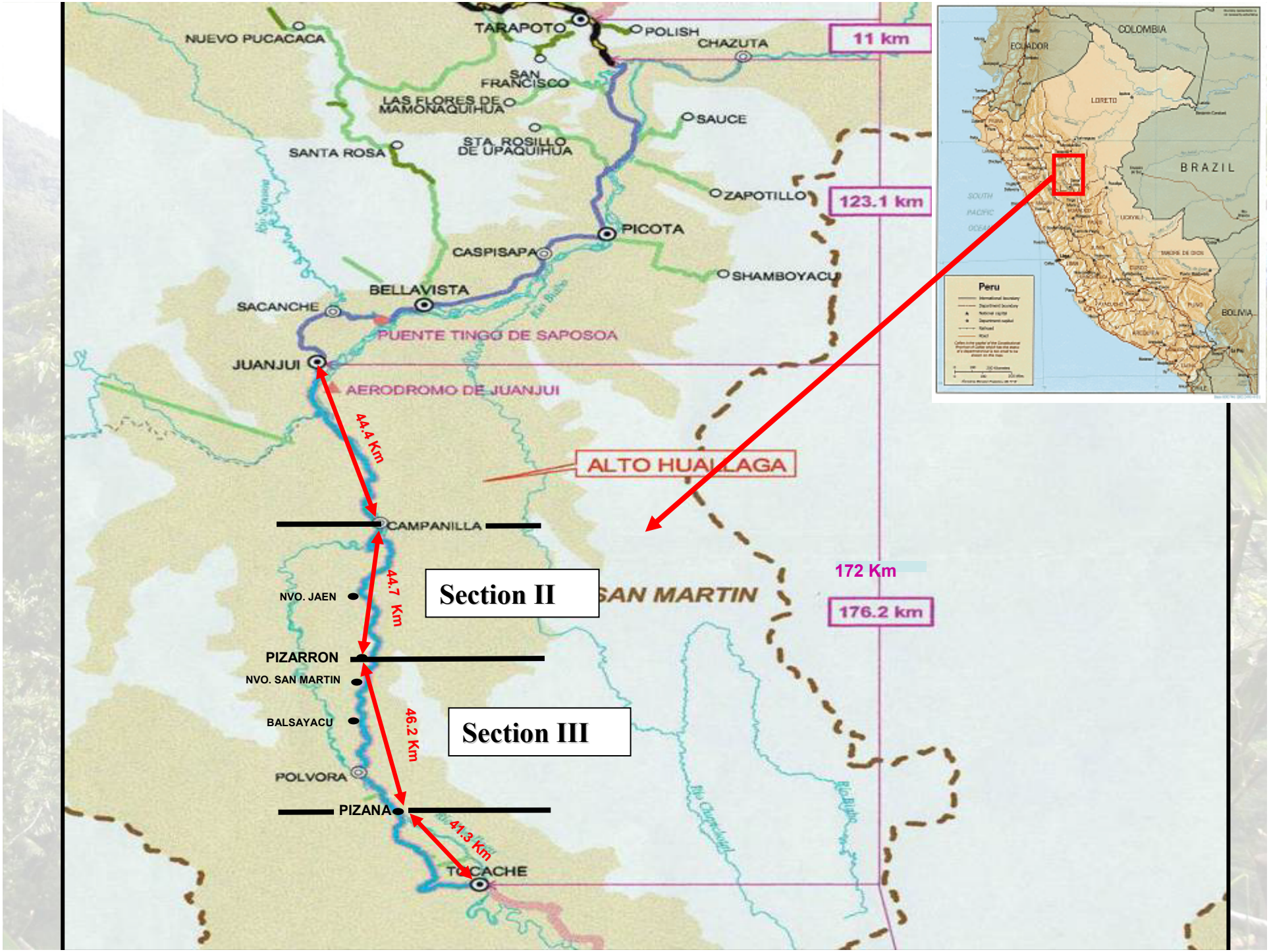
Presented By

Michael P. Wielputz, P.E.

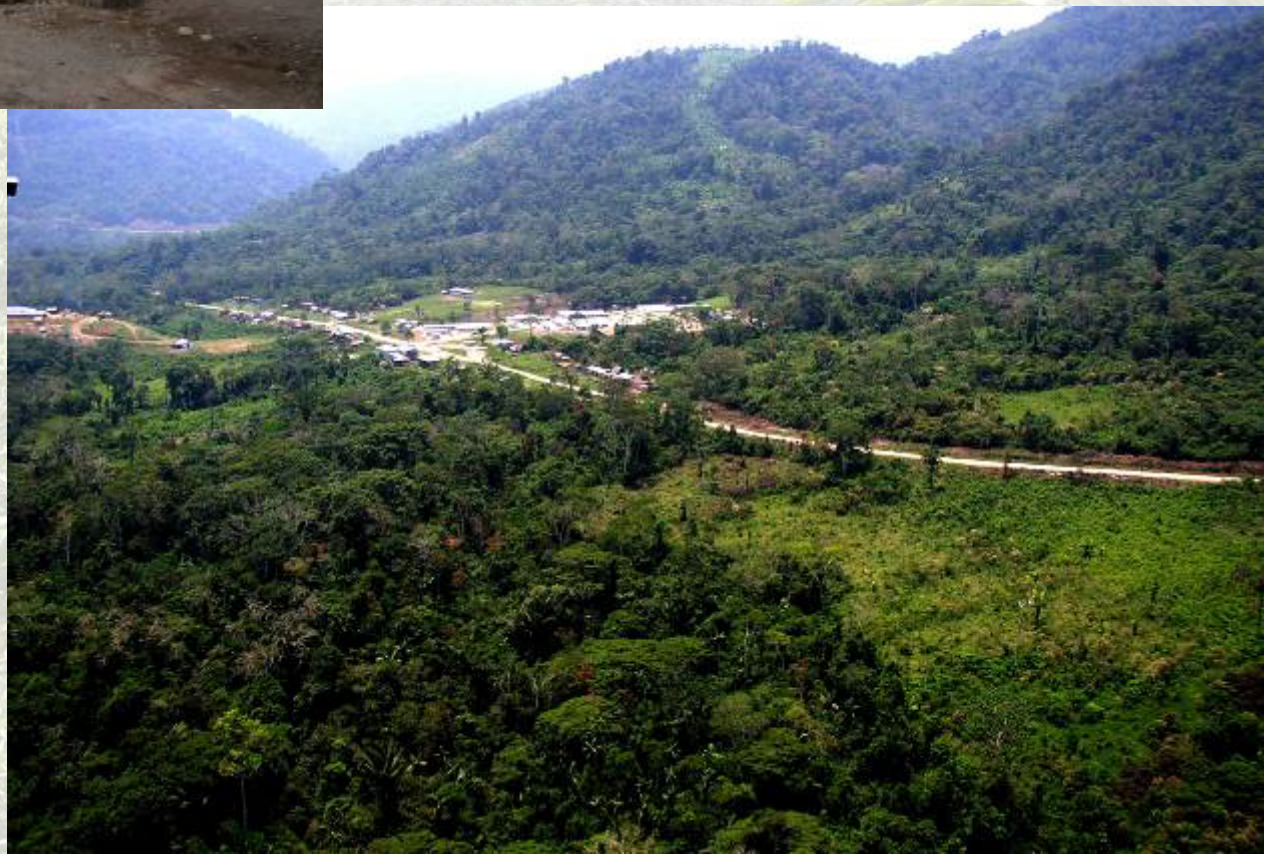

Colombia
Ecuador
Tumbes
Loreto
Piura
Amazonas
Cajamarca
Lambayeque
San Martin
Brasil
La Libertad
Ancash
Huánuco
Ucayali
Pasco
Junin
Lima
Madre de Dios
Huancavelica
Ayacucho
Cusco
Apurimac
Ica
Puno
Bolivia
Arequipa
Moquegua
Chile
Tacna
Perú

U.S. Army Corps of Engineers – Andrade Gutierrez
Sections II & III

Section	Km	Responsible
Section I Juanjui – Campanilla	44.4	PROVIAS NACIONAL
Section II **Campanilla – Pizarron**	**44.7**	ANDRADE GUTIERREZ Construtora Andrade Gutierrez SA
Section III **Pizarron – Puerto Pizana**	**46.2**	ANDRADE GUTIERREZ Construtora Andrade Gutierrez SA
Section IV Pizana – Tocache	41.3	PROVIAS NACIONAL


NUEVO PUCACACA
TARAPOTO
POLISH
CHAZUTA
11 km
SAN FRANCISCO
LAS FLORES DE MAMONAQUIHUA
SAUCE
SANTA ROSA
STA. ROSILLO DE UPAQUIHUA
ZAPOTILLO
123.1 km
PICOTA
CASPISAPA
SHAMBOYACU
BELLAVISTA
SACANCHE
PUENTE TINGO DE SAPOSOA
JUANJUI
AERODROMO DE JUANJUI
44.4 Km
ALTO HUALLAGA
CAMPANILLA
172 Km
NVO. JAEN
44.7 Km
Section II
SAN MARTIN
176.2 km
PIZARRON
NVO. SAN MARTIN
BALSAYACU
46.2 Km
Section III
POLVORA
PIZANA
41.3 Km
TOCACHE
COLOMBIA
ECUADOR
LORETO
BRAZIL
SOUTH PACIFIC OCEAN
UCAYALI
PASCO
JUNIN
HUANUCO
BOLIVIA
Peru

AG Base Camp
Nuevo San Martin

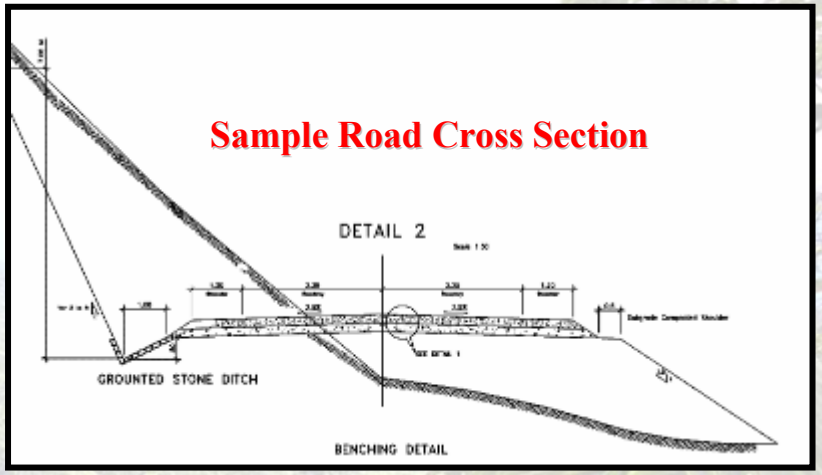


Local Areas Affected

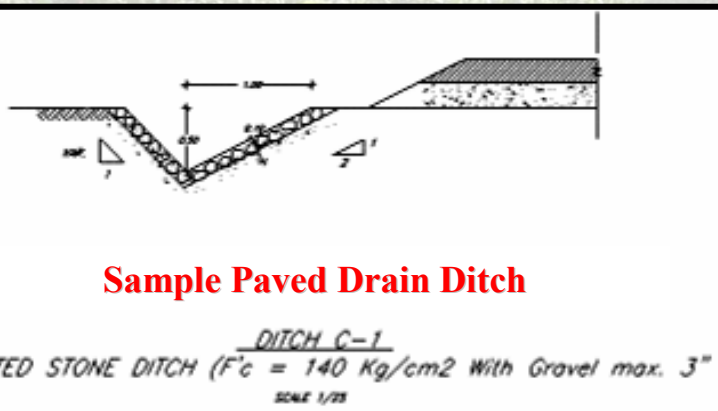
Original Design Improvements for Sections II & III

Section II: 44.68 km
Campanilla-Pizarron

- Road Widening - 6.6 m
- Culverts replaced, added, or improved – approximately 270
- Subdrainage & Ditching added
- Retaining Walls
- Bridges added - 5



Sample Road Cross Section



Sample Paved Drain Ditch

Section III: 46.2 km
Puerto Pizana-Pizarron

- Road Widening - 6.6 m (var.)
- Culverts replaced, added, or improved – approximately 203
- Subdrainage & Ditching added
- Retaining Walls
- Bridges added - 7

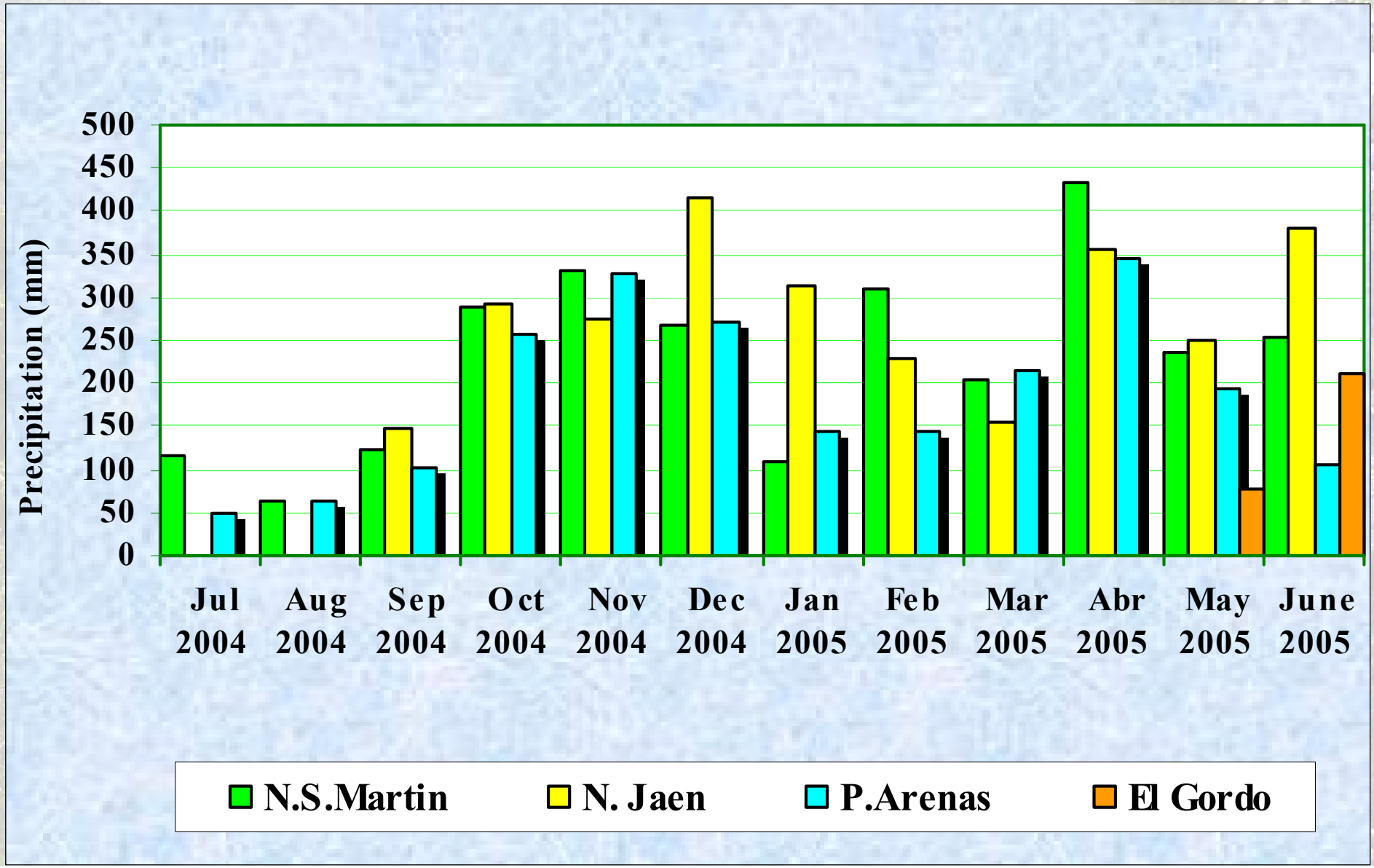
Challenges of Peru Road Project

Early Challenges

- Location – remote mountainous jungle area with limited access
- Environment – dense forest with significant rainfall
- Early condition of Road – practically impassable
- Original Design Problems, lack of foundation & slope stability studies
- Extensive variety of in-place Soil & Rock classifications
- Landslides – Cost $$$$$, damaging completed work
- Drainage and De-watering
- Overcoming common construction practices
- Personnel Security


Rainfall Events

Monthly Rainfall 2004 & 2005



Early Conditions

Early Conditions

Early Conditions

Early Conditions

Need for Management of Drainage

Improvements
Clearing
Section III

Improvements
Road Widening
Section II

Improvements in Drainage

Culvert Installations


Culvert Construction

Improvements
Low Water Crossing

Improvements
Bridge


Bridge Construction

Punta Arena Operations:
Concrete Plant

Punta Arena Operations:
Rock Crushing & Sieving Plant, Laboratory, Maintenance Facility & Materials Storage

Balsayacu Quarry


Construction Methods
CAT
325B L
CAT
NL10

Construction Methods


Construction Methods

Construction Methods

Construction Methods

Construction Methods

Construction Methods


Construction Methods

Construction Methods

Construction Methods

Construction Methods

Construction Methods


Construction Methods

Variety of Soil & Rock

Variety of Soil & Rock

Variety of Soil & Rock


Variety of Soil &
Rock

Variety of Soil & Rock

Variety of Soil & Rock

Variety of Soil & Rock

Variety of Soil & Rock

Landslides

Landslides

Landslides


Landslide
"Before"

Landslide “After”

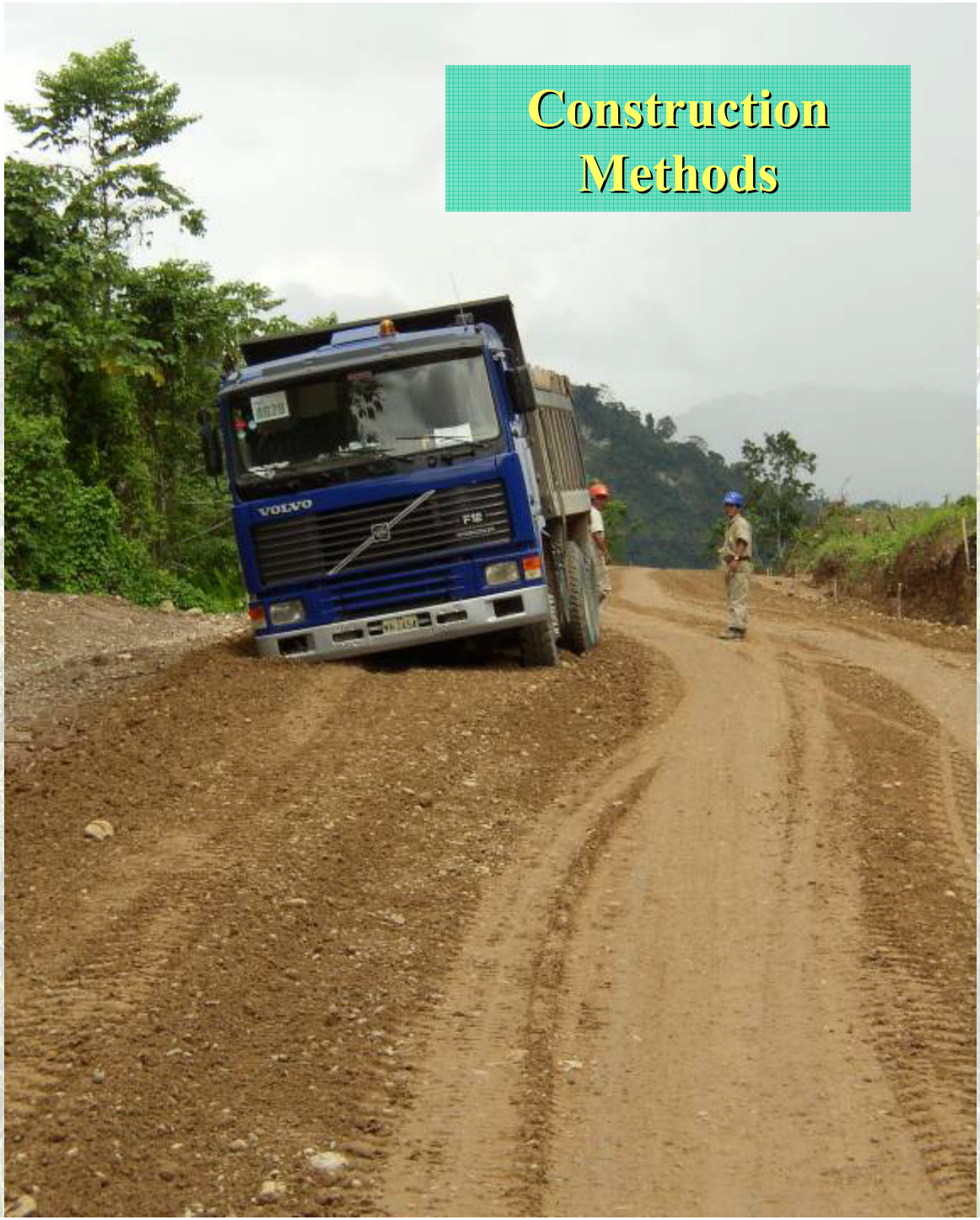
Landslides $$$ exceed Contingencies

Cost of slide cleanup offset by Re-design

- Delete unnecessary bridges, add box culverts where applicable
- Extending/reusing satisfactory culverts
- Use of nearby select granular borrow for platform stabilizing, backfill, and subbase course
- Eliminate some cuts & fills, follow the “lay of the land” where practical
- Road re-alignment away from slides
- Adjusting pavement design layers

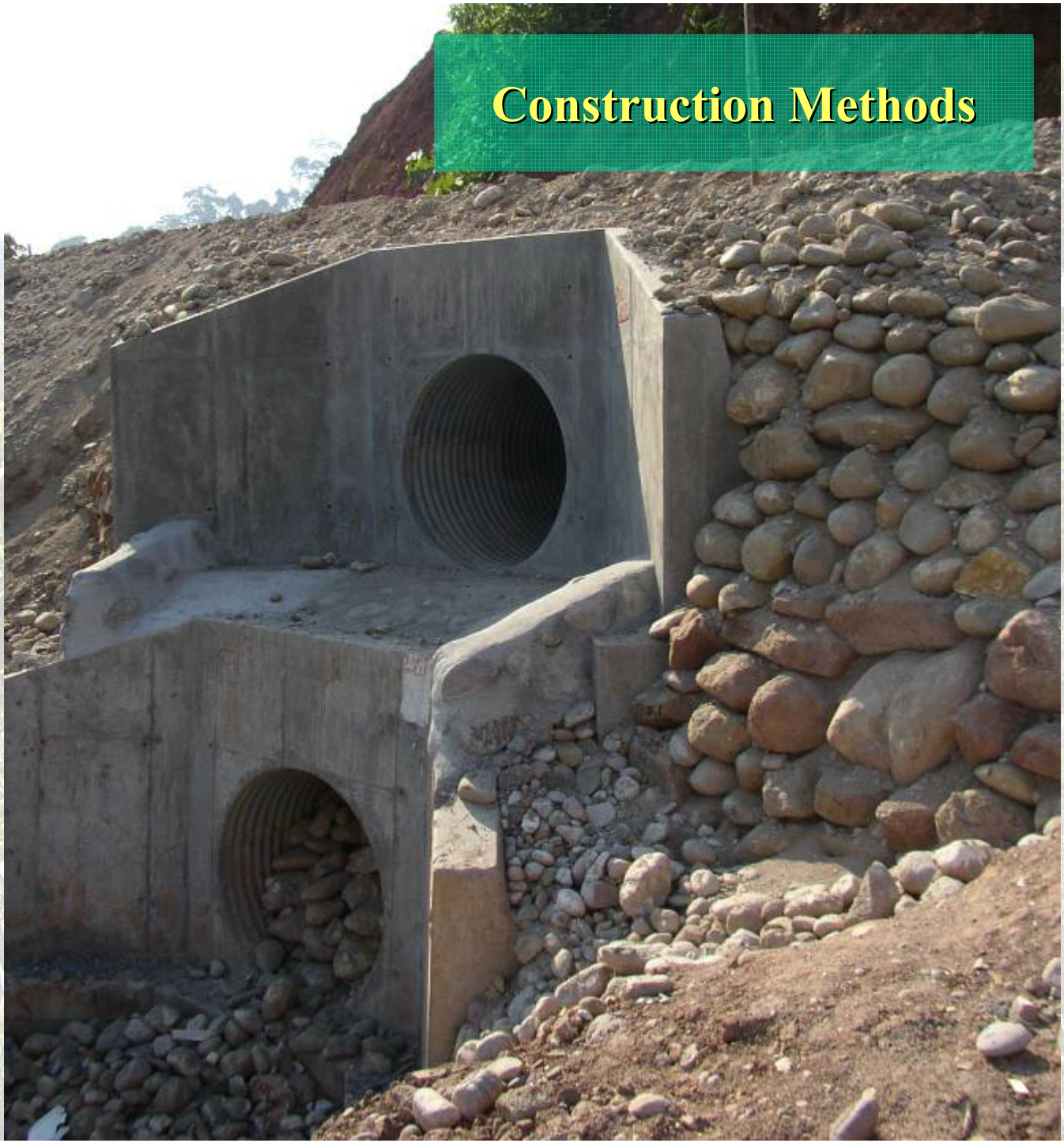

Drainage & De-watering
72"

Construction Methods

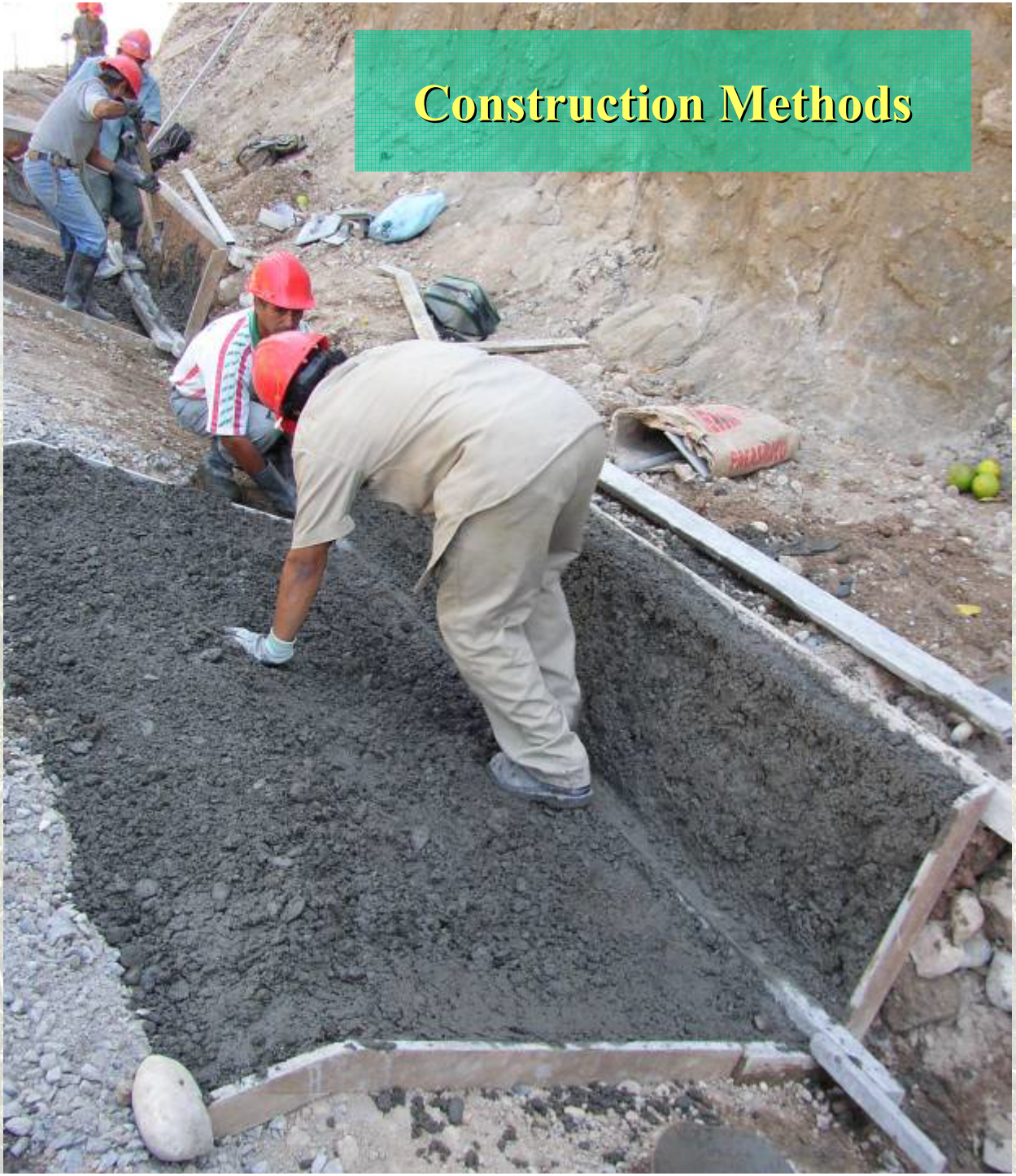



Construction
Methods

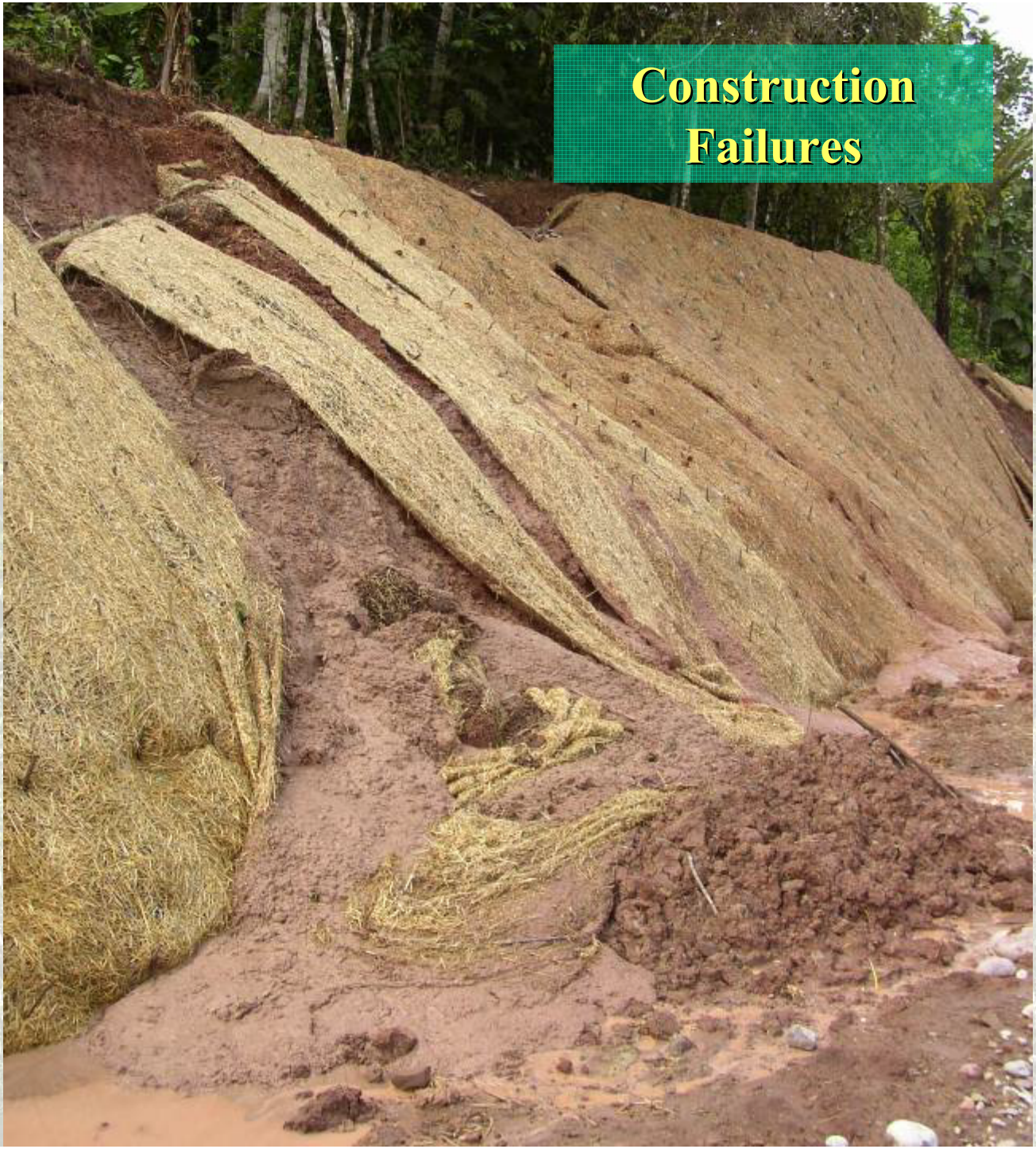
Construction Methods



Construction Methods




Construction
Failures


Construction
Failures


Personnel Security

Challenges of Peru Road Project

Lessons Learned/Solutions

- Minimize clearing & grubbing - only execute in immediate foundation areas, while promoting jungle growth
- Reduce slope cuts, contrary to common engineering practice of lowering slope angles for unstable areas. Some slides are exacerbated by larger exposed surfaces
- Locate additional satisfactory material borrow sources (granular)
- Continuous training/instruction for contract staff and labor force
- Avoiding deep culverts, relocating new ones and plugging old culverts
- Erosion control – adding "Trinchos" and stepped Grouted Cobble Flumes
- Continuous maintenance of drainage ditches & inlets during construction activities – Prevent water ponding

Contact Information

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