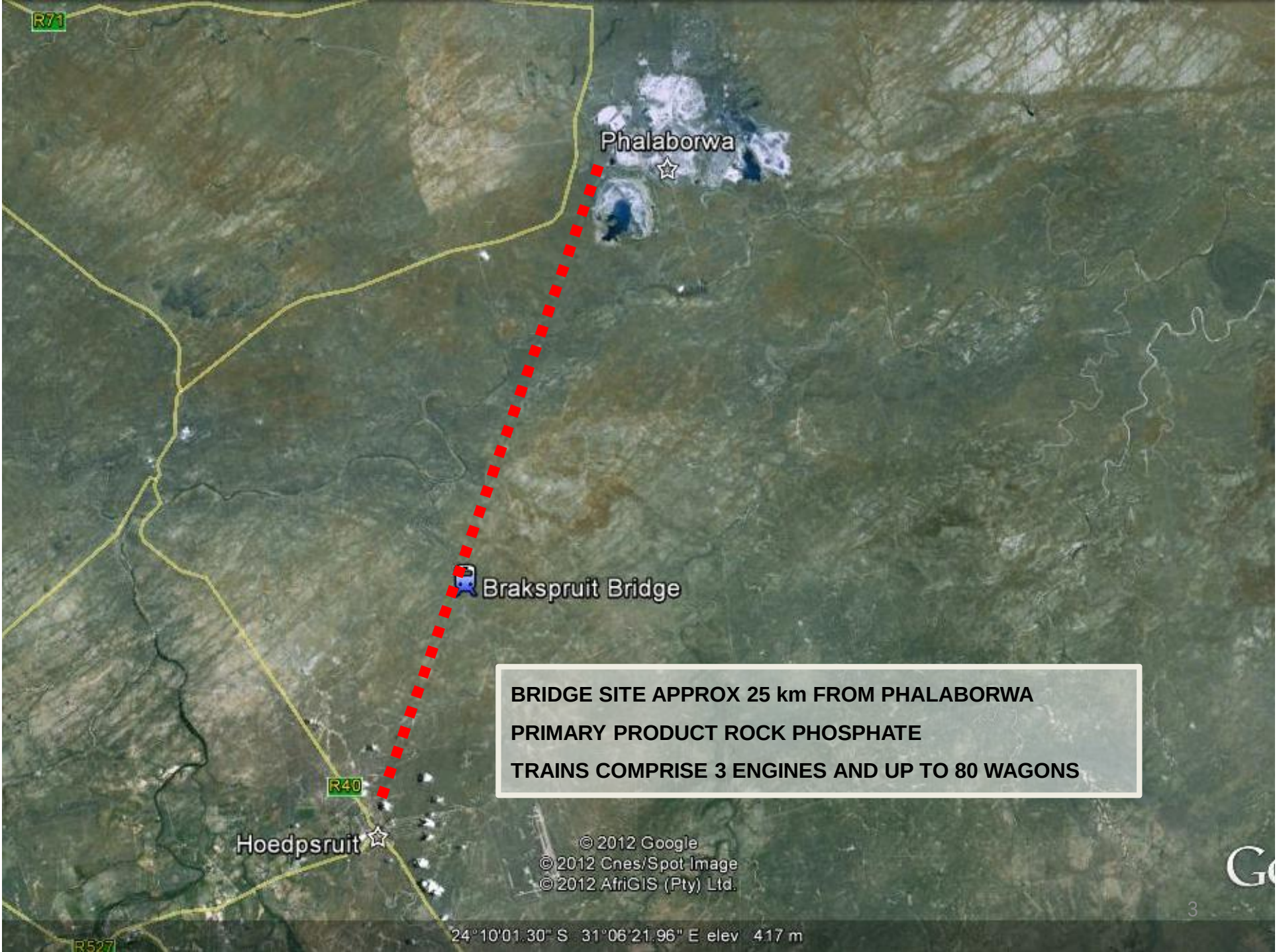
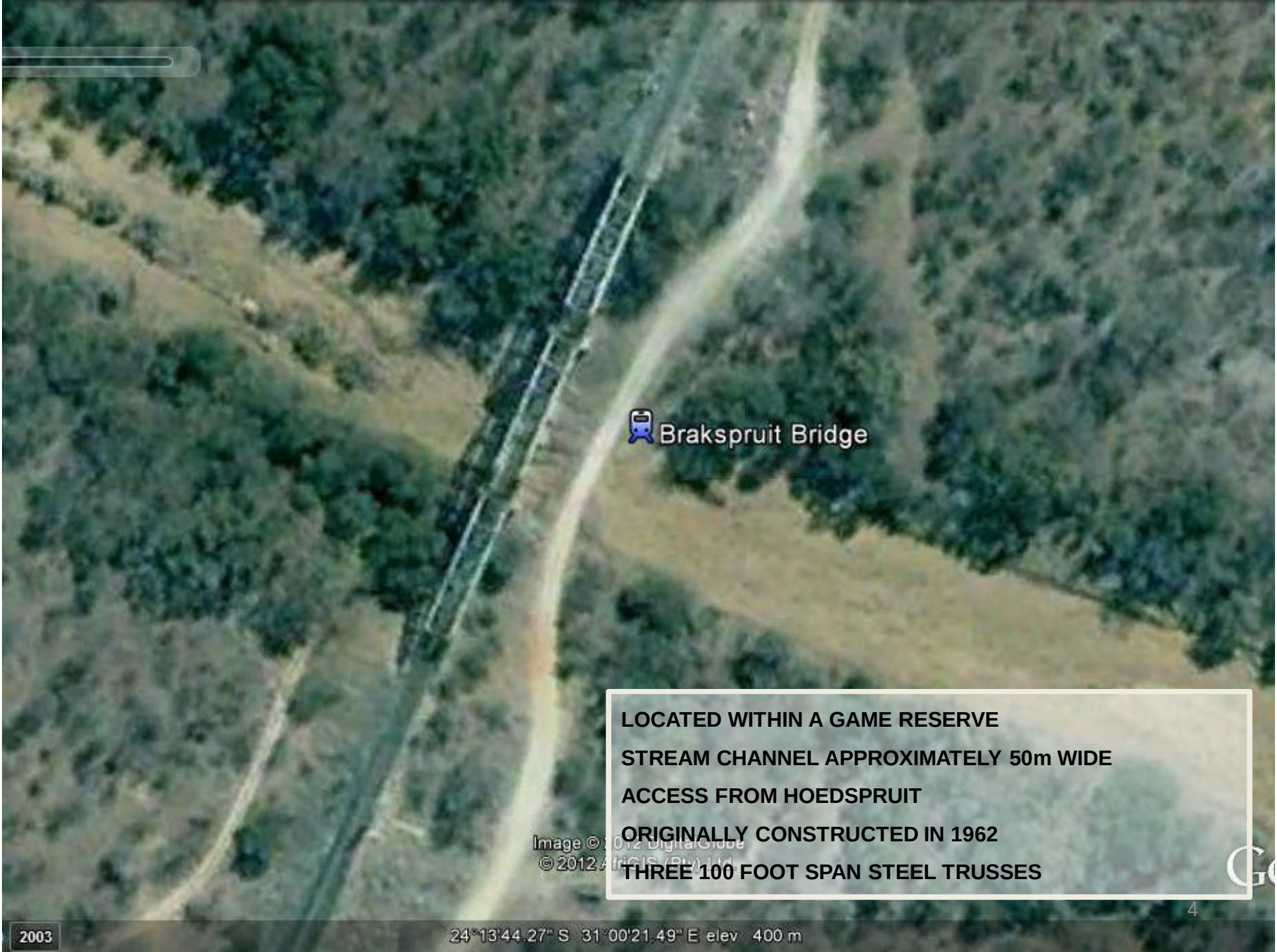


BRAKSPRUIT BRIDGE PROJECT

CLIENT	TRANSNET FREIGHT RAIL
PROJECT MANAGER	TRANSNET CAPITAL PROJECTS
ENGINEER	GOBA
MAIN CONTRACTOR	STEFANUTTI STOCKS


Brakspruit Bridge
Phalaborwa
Johannesburg
Richards Bay
Durban
BRIDGE LOCATED ON RICHCOR RAIL CORRIDOR
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2012 Cnes/Spot Image
28°40'18.26" S 25°31'41.77" E elev 1272 m


R71
Phalaborwa
Brakspruit Bridge
BRIDGE SITE APPROX 25 km FROM PHALABORWA
PRIMARY PRODUCT ROCK PHOSPHATE
TRAINS COMPRISE 3 ENGINES AND UP TO 80 WAGONS
R40
Hoedpsruit
© 2012 Google
© 2012 Cnes/Spot Image
© 2012 AfriGIS (Pty) Ltd.
24°10'01.30" S 31°06'21.96" E elev 417 m
R527



LOCATED WITHIN A GAME RESERVE

STREAM CHANNEL APPROXIMATELY 50m WIDE

ACCESS FROM HOEDSPRUIT

ORIGINALLY CONSTRUCTED IN 1962

THREE 100 FOOT SPAN STEEL TRUSSES



TYPICAL 100 FOOT SPAN TRUSS



TRAIN DERAILED 20 SEPTEMBER 2010

EXACT SEQUENCE UNKNOWN

TRAIN DRIVER UNINJURED

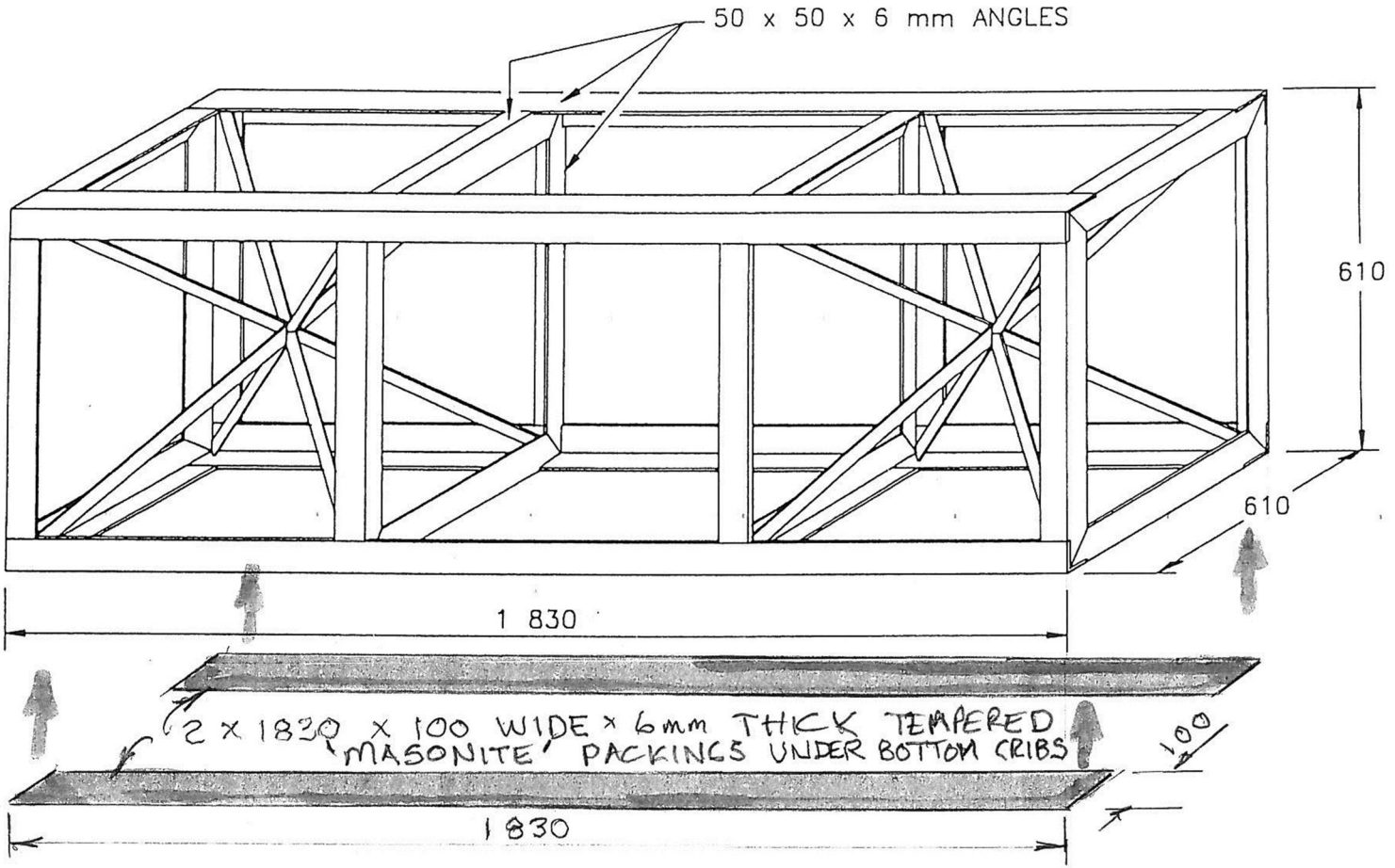

TWO SPANS COMPLETELY DEMOLISHED
THIRD SPAN DISLODGED
MATERIAL AVAILABLE FOR TWO SPANS ONLY



TRANSNET CONSTRUCTION TEAM MOBILISED TO CLEAR SITE

MAJOR FINANCIAL LOSSES TO TRANSNET WITH LINE OUT OF SERVICE

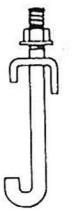
TIME OF THE ESSENCE



DETAIL OF BRIDGING CRIB

LOAD CAPACITY/LEG = 2,5 tonne
TOTAL CAPACITY = 20 tonne

TRANSNET "LEGO BLOCKS"



INTERLOCKING CLIP

PART OF BE 6115


MASS CONCRETE FOUNDATIONS
TWO TEMPORARY SUPPORTS 12m HIGH
800 CRIBS REQUIRED
ADDITIONAL BRACING INSTALLED
PLATE GIRDERS 15,2M LONG
CONCRETE PEDESTALS ON PIERS



TEMPORARY STRUCTURE COMPLETE IN JUST 5 WEEKS

RISK MITIGATION – STRUCTURE NOT ROBUST

- **SPEED RESTRICTIONS**
- **REMOTE MONITORING SYSTEM**
- **DEBRIS CATCH FENCE**

1. GENERAL DESIGN NOTES

DESCRIPTION - THE BRIDGE IS A 3 SPAN PRECAST BEAM & INSITU DECK SLAB ON WALL TYPE PIERS & SPILL THROUGH ABUTMENTS
DESIGN METHOD - LIMIT STATE
DESIGN CODE - TMH7 PART 3
COMPUTER PROGRAMS USED: -LUSAS

2. DESIGN LOADING

IN ACCORDANCE WITH SATS BRIDGE CODE (1993)
LIVE LOAD - NR
DEAD LOAD - BASED ON CONCRETE DENSITY OF 2500 kg/m³
EARTH PRESSURE - BASIC OF Ka=0.3kPa/m
INTERNAL ANGLE OF FRICTION - 30 deg.
INSITU DENSITY - 19kN/m³

3. DESIGN PARAMETERS

YOUNG'S MODULUS
CONCRETE - 31 x 10 kPa
STEEL - 200 x 10 kPa
STRAND - 200 x 10 kPa
CREEP FACTOR - 36 x 10 /m
FRICTION - 0.20 rad
WOBBLE - 20x10 /m
TEMP COEFFICIENT - 12 x 10 -6 °C
BEARING FRICTION - 0.04

4. MATERIAL STRENGTH & STRESSES

CONCRETE: CLASS (MPa/mm)

BLINDING - 15/19
FOUNDATIONS - 30/19
ABUTMENTS & PIERS - 30/19
DECK - 40/19
PRECAST BEAMS - 50/19

REINFORCEMENT:
MILD STEEL - 250 MPa
HIGH STRESS STEEL - 450 MPa

PRESTRESSING STEEL:
MINIMUM U.T.S. OF TENDONS - 1860 MPa
JACKING STRESS - 75% OF U.T.S.
STEEL RELAXATION LOSS - 2%

5. SUBSTRUCTURE

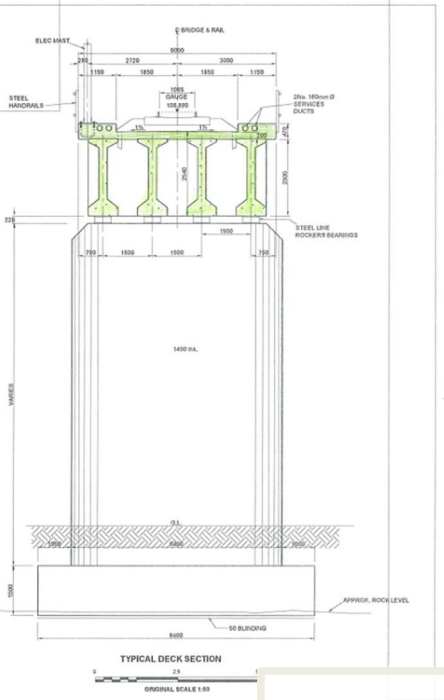
FOUNDING MATERIAL -
SPREAD FOOTINGS ON SOFT ROCK
ALLOWABLE BEARING PRESSURE - 650kPa
CONCRETE FINISHES:
ALL EXPOSED FINISHES - F2
ALL CONCEALED FINISHES - F1
BEARINGS - LEVE ROCKERS
CONCRETE COVER:
CAST AGAINST EARTH - 75mm
FOUNDATIONS (SHUTTERED) - 50mm
EXPOSED SURFACES - 50mm
CHAMFERS TO ALL EXPOSED SHARP CORNERS - 25 x 25mm

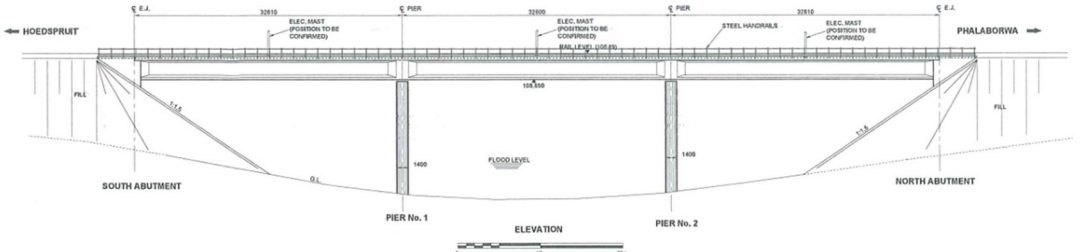
6. SUPERSTRUCTURE

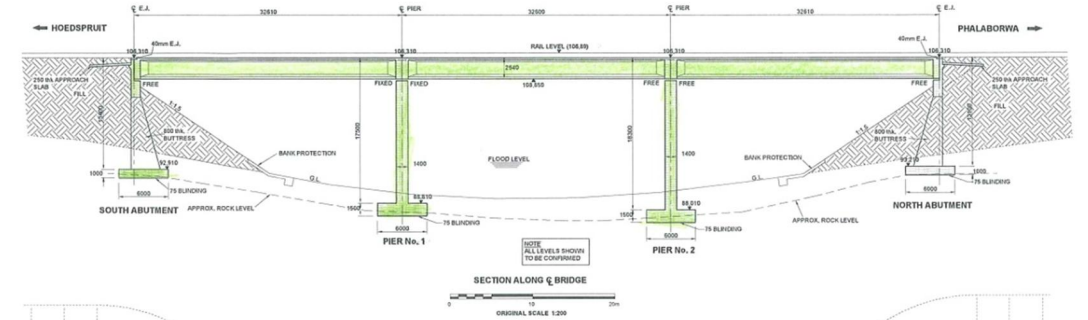
METHOD OF ANALYSIS - LINEAR
FINISH:
DECK - F2
PARAPET - F3
EXPANSION JOINTS - CLAW TYPE JOINT
CONCRETE COVER - BEAMS - 40mm
SLAB - 50mm
CHAMFERS TO ALL EXPOSED SHARP CORNERS - 25 x 25mm

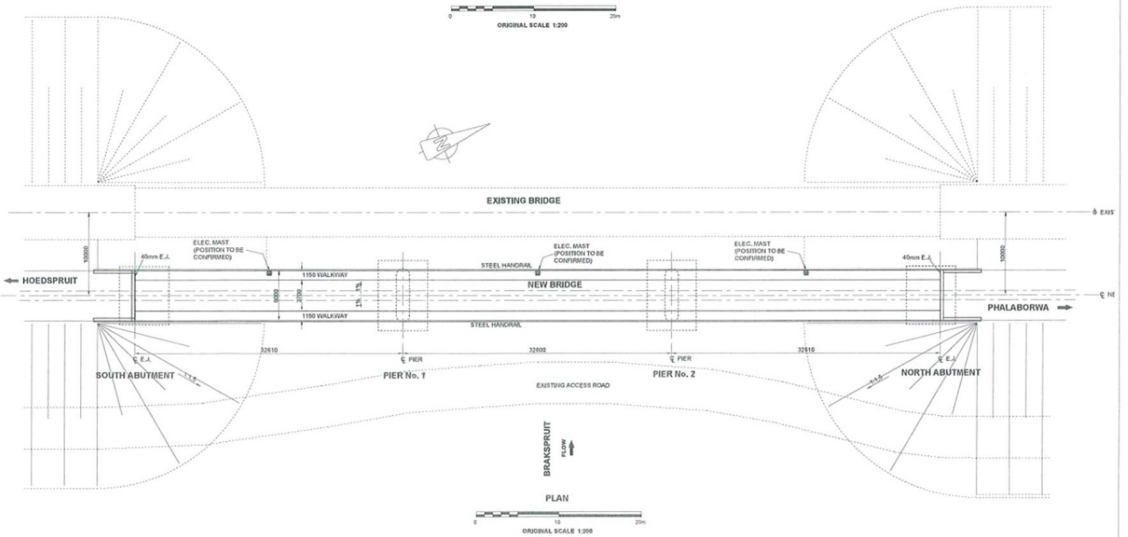
7. GENERAL

JOINTS & BEARINGS TO BE INSTALLED BY SPECIALISTS









ORIGINAL CONCEPT REPLACEMENT STRUCTURE

PARALLEL ALIGNMENT

NOTES
1. DO NOT SCALE DRAWING - ONLY DIMENSIONS SHOWN TO BE USED.
2. THE CONTRACTOR SHALL VERIFY ALL CONDITIONS, DIMENSIONS AND LEVELS ON THE SITE AND NOTIFY THE NEC SUPERVISOR OF ANY VARIATIONS BEFORE CONSTRUCTION.

DRAWING NO. REFERENCE
REFERENCE DRAWINGS

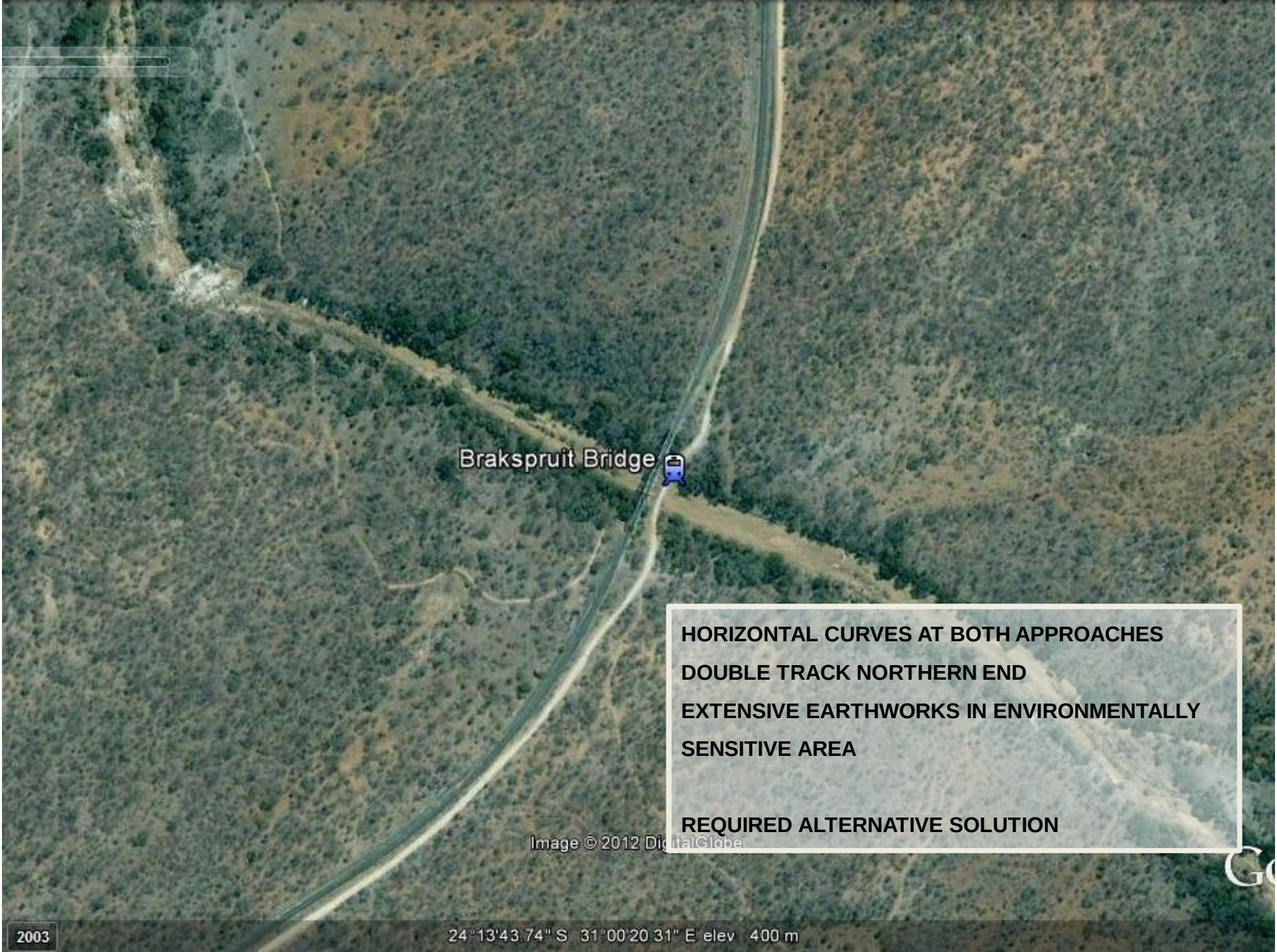
REVISIONS

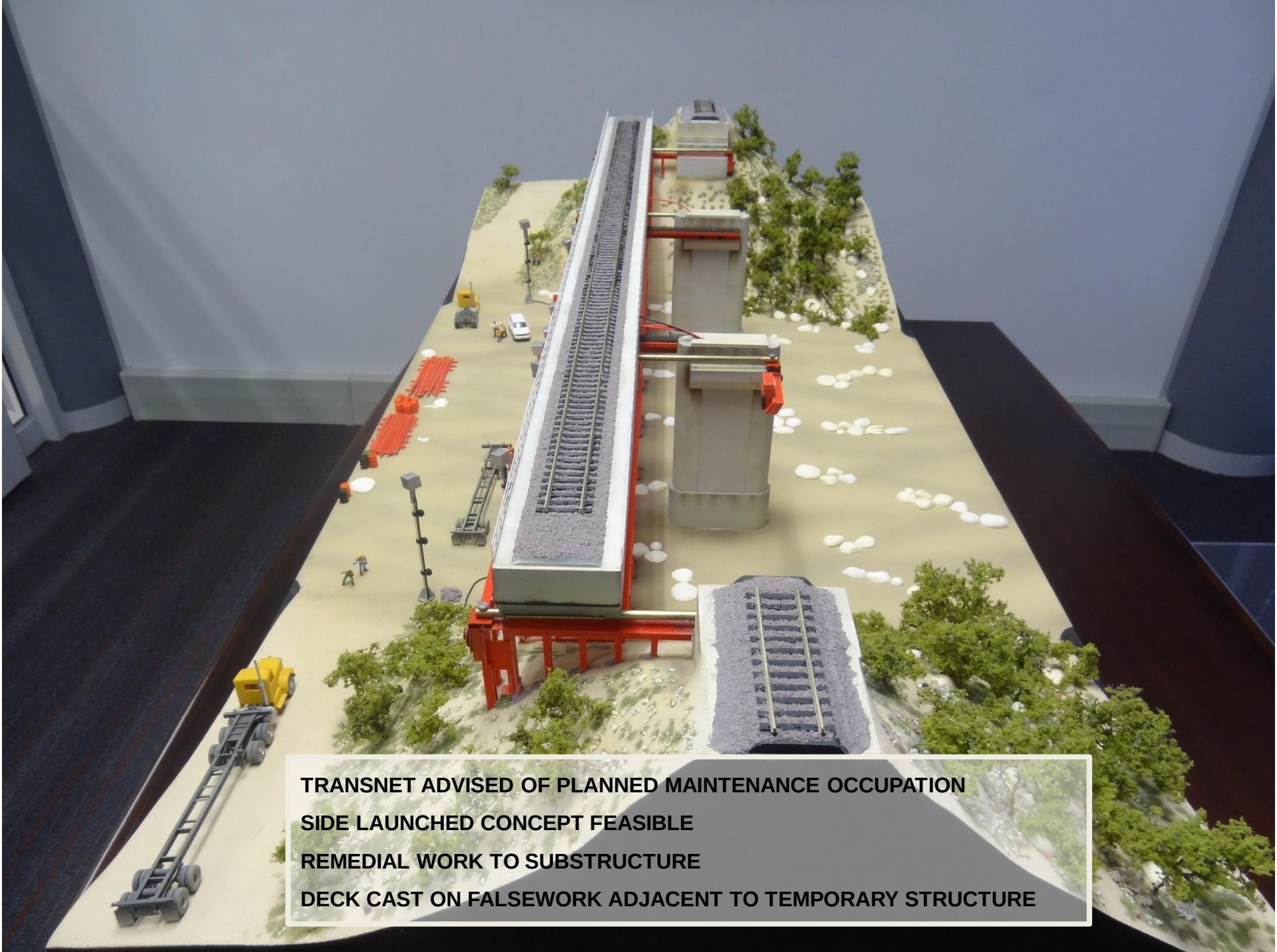
CONTRACTOR / CONSULTANT
TRANSNET CAPITAL PROJECTS
Transnet Capital Projects

DRAWN F.E.
CHECKED D.H.
DESIGNED D.H.
CHECKED P.S.
OPERATIVE DIVISIONS
PE ENG. / PR TECH./PR. ARCH
NAME G. HOOPER
SIGNATURE
REG. NUMBER
SCALE AS SHOWN A0

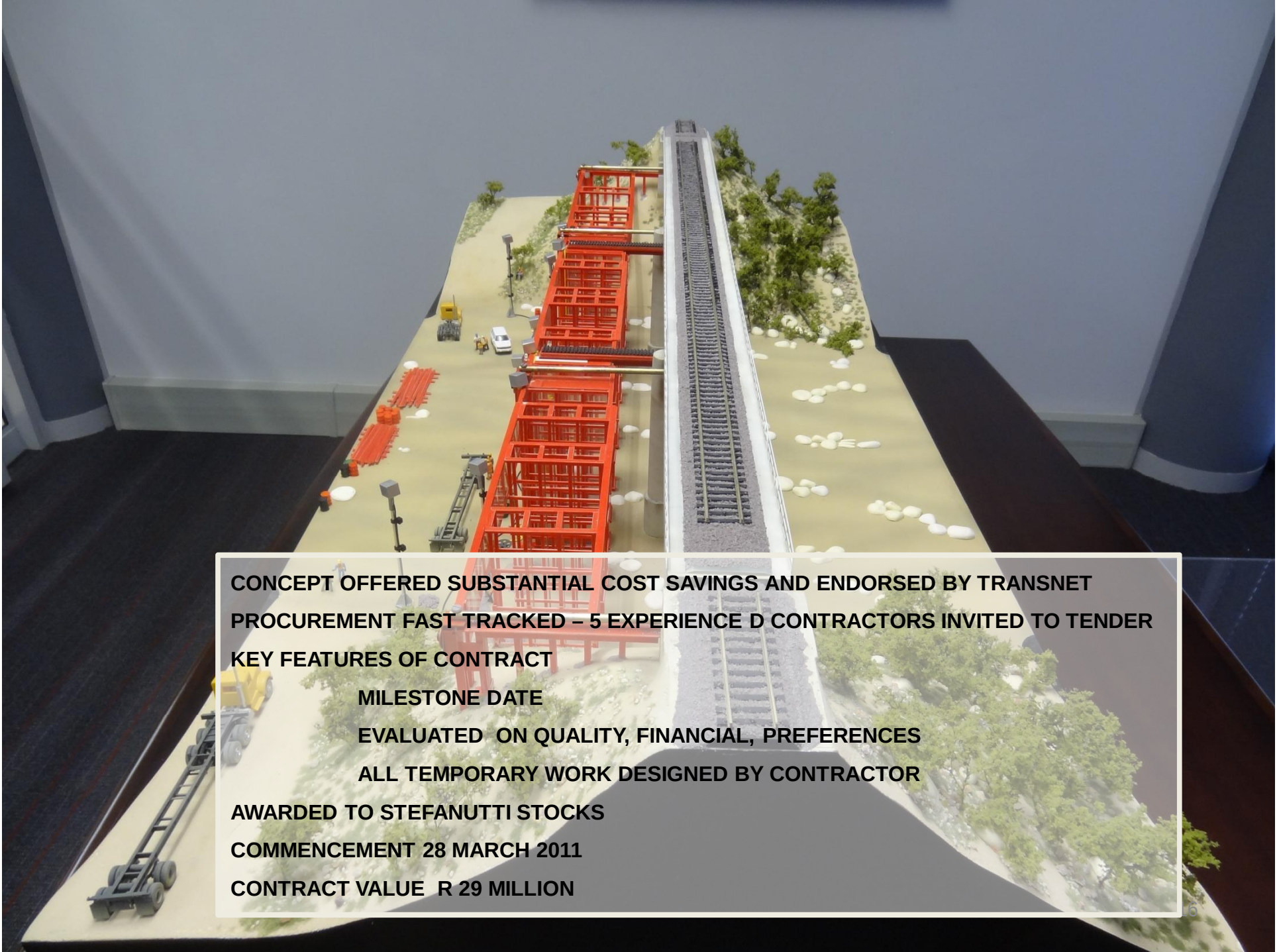
XXXXXXXXXX
BRAKSPRUIT RAIL BRIDGE
GENERAL ARRANGEMENT

PROJECT NUMBER | DIS | FAS | DIS | DRAWING NO. | SHEET | REV. | ID
TD


Brakspruit Bridge
HORIZONTAL CURVES AT BOTH APPROACHES
DOUBLE TRACK NORTHERN END
EXTENSIVE EARTHWORKS IN ENVIRONMENTALLY SENSITIVE AREA
REQUIRED ALTERNATIVE SOLUTION
Image © 2012 DigitalGlobe
2003
24°13'43.74" S 31°00'20.31" E elev 400 m


TRANSNET ADVISED OF PLANNED MAINTENANCE OCCUPATION
SIDE LAUNCHED CONCEPT FEASIBLE
REMEDIAL WORK TO SUBSTRUCTURE
DECK CAST ON FALSEWORK ADJACENT TO TEMPORARY STRUCTURE


CONTINUOUS SLIDE PATH ON TO EXISTING SUBSTRUCTURE
USING PROVEN INCREMENTAL LAUNCH TECHNIQUES



CONCEPT OFFERED SUBSTANTIAL COST SAVINGS AND ENDORSED BY TRANSNET

PROCUREMENT FAST TRACKED – 5 EXPERIENCE D CONTRACTORS INVITED TO TENDER

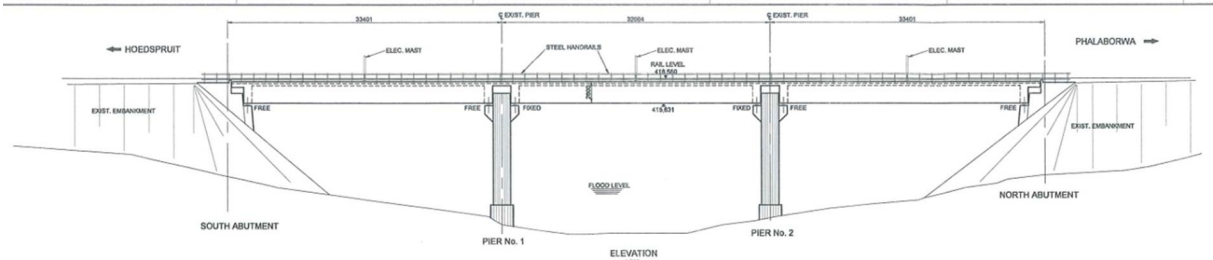
KEY FEATURES OF CONTRACT

- **MILESTONE DATE**
- **EVALUATED ON QUALITY, FINANCIAL, PREFERENCES**
- **ALL TEMPORARY WORK DESIGNED BY CONTRACTOR**

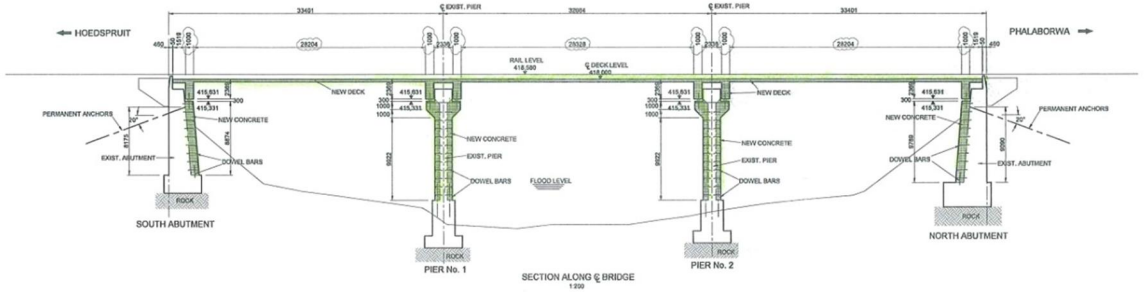
AWARDED TO STEFANUTTI STOCKS

COMMENCEMENT 28 MARCH 2011

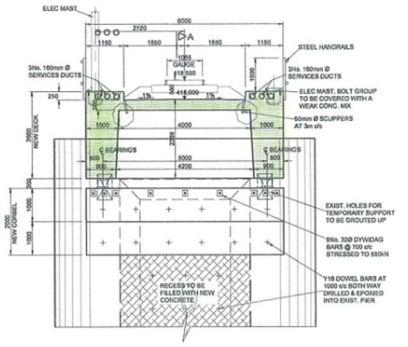
CONTRACT VALUE R 29 MILLION



ELEVATION
1:200



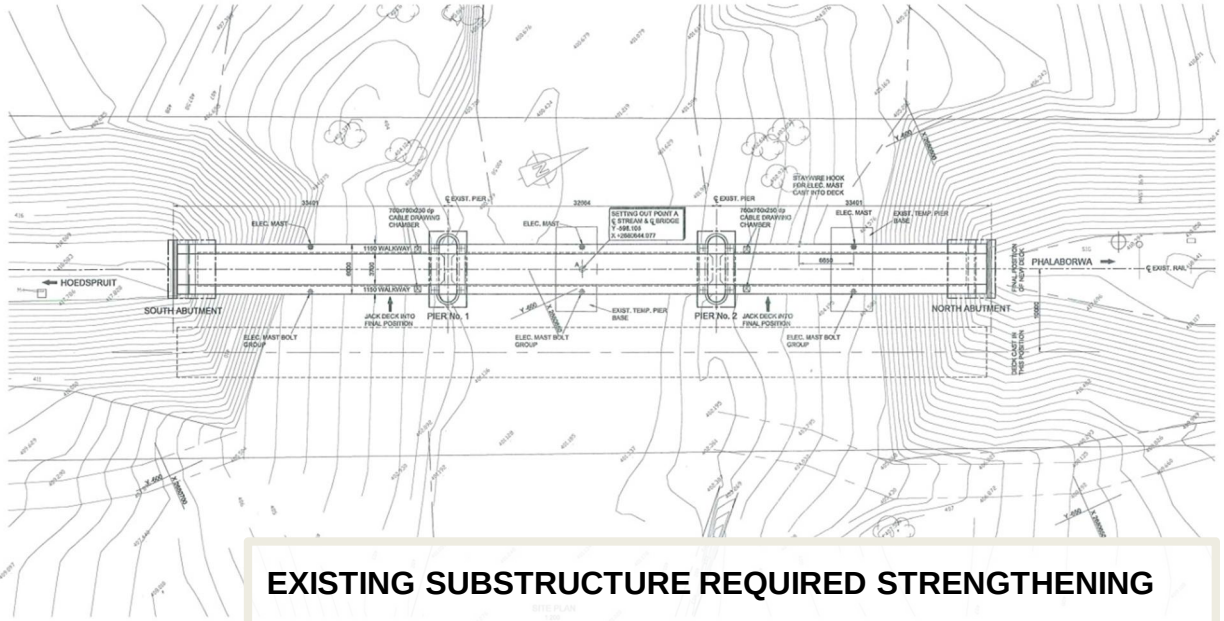
SECTION ALONG C BRIDGE
1:200



TYPICAL SECTION AT PIERS
1:50

DRAWING LIST

GA 0001 GENERAL ARRANGEMENT
GA 0002 TYPICAL TEMPORARY WORKS ARRANGEMENTS
DE 0001 PIER CONCRETE DETAILS
DE 0002 ABUTMENT CONCRETE DETAILS
DE 0003 DECK CONCRETE DETAILS
DE 0004 DECK PRESTRESSING DETAILS
DE 0005 HANDRAIL DETAILS
RD 0001 PIER REINFORCEMENT DETAILS
RD 0002 ABUTMENT REINFORCEMENT DETAILS
RD 0003 DECK REINFORCEMENT DETAILS
BS 0001 BENDING SCHEDULE



1. GENERAL DESIGN NOTES

DESCRIPTION - THE BRIDGE IS A 3 SPAN BEAM & SLAB DECK ON STRENGTHENED EXIST. SUB-STRUCTURE
DESIGN METHOD - LIMIT STATE
DESIGN CODE - TMH7 PART 3

2. DESIGN LOADING

IN ACCORDANCE WITH SATS BRIDGE CODE (1983)
LIVE LOAD - NIL
DEAD LOAD - BASED ON CONCRETE DENSITY OF 2500 kg/m³
EARTH PRESSURE - BASIC CP Ka = 7.6kPa/m
INTERNAL ANGLE OF FRICTION - 30 deg.
INSITU DENSITY - 18kN/m³

3. DESIGN PARAMETERS

YOUNG'S MODULUS
CONCRETE - 31 x 10³ kPa
STEEL - 200 x 10³ kPa
STRAND - 200 x 10³ kPa
CREEP FACTOR - 36 x 10⁶/m
FRICTION - 0.20/rad
WOBBLE - 20x10⁻⁶/m
TEMP COEFFICIENT - 12 x 10⁻⁶/ °C
BEARING FRICTION - 0.04

4. MATERIAL STRENGTH & STRESSES

CONCRETE: CLASS(MPa/mm)

BUILDING - 15/19
FOUNDATIONS - 30/19
ABUTMENTS & PIERS - 30/19
DECK - 40/19

REINFORCEMENT:
MILD STEEL - 250 MPa
HIGH STRESS STEEL - 450 MPa

PRESTRESSING STEEL:
MINIMUM U.T.S. OF TENDONS - 1860 MPa
JACKING STRESS - 76% OF U.T.S.
STEEL RELAXATION LOSS - 2%

5. SUBSTRUCTURE

FOUNDING MATERIAL -
SPREAD FOOTINGS ON ROCK
ALLOWABLE BEARING PRESSURE - 1000kPa
CONCRETE FINISHES
ALL EXPOSED FINISHES - F2
ALL CONCEALED FINISHES - F1
BEARINGS - STEEL POT BEARINGS
CONCRETE COVER;
CAST AGAINST EARTH - 75mm
FOUNDATIONS (SHUTTERED) - 50mm
EXPOSED SURFACES - 40mm
CHAMFERS TO ALL EXPOSED SHARP CORNERS - 25 x 25mm

6. SUPERSTRUCTURE

METHOD OF ANALYSIS - LINEAR
FINISH
DECK - F2
PARAPET - F3
EXPANSION JOINTS - CLAW TYPE JOINT & COVER PLATE
CONCRETE COVER - BEAMS - 40mm
- SLAB: TOP - 50mm
BOTTOM - 40mm
CHAMFERS TO ALL EXPOSED SHARP CORNERS - 25 x 25mm

7. GENERAL

JOINTS & BEARINGS TO BE INSTALLED BY SPECIALISTS

EXISTING SUBSTRUCTURE REQUIRED STRENGTHENING

NEEDED TO MAINTAIN VERTICAL ALIGNMENT

SIMPLY SUPPORTED PRESTRESSED DECK

NO INTERMEDIATE JOINTS

GOBA
No. 1 Ridge 63
8 Scientia Crescent
La Lucia Ridge Office Estate
DURBAN
+27 31 583 3400 Tel
+27 31 583 3401 Fax

CONTRACTOR / CONSULTANT | TRANSNET CAPITAL PROJECTS

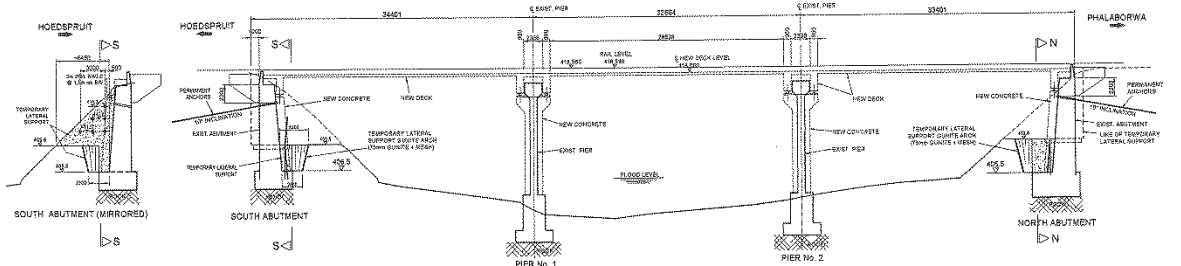
Transnet Capital Projects
Transnet SOC (Trading as Transnet Capital Projects)
Reg No 1914/035038/06
PRIVATE BAG X4
GALLEWOOD
3302
TEL 013 944 0000
FAX 013 943 0808

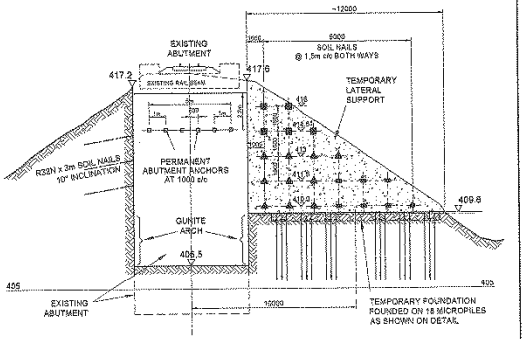
BRAKSPRUIT RAIL BRIDGE

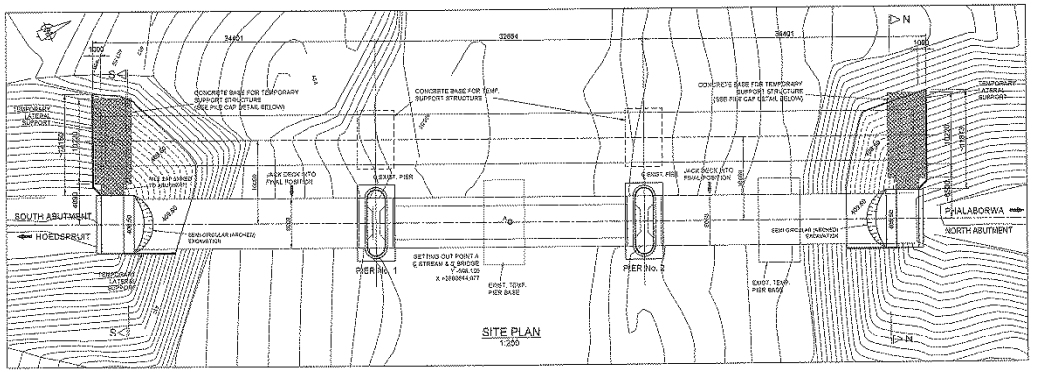
GENERAL ARRANGEMENT

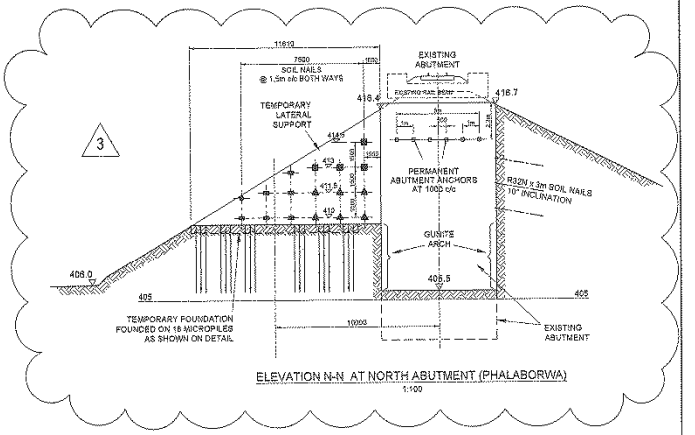
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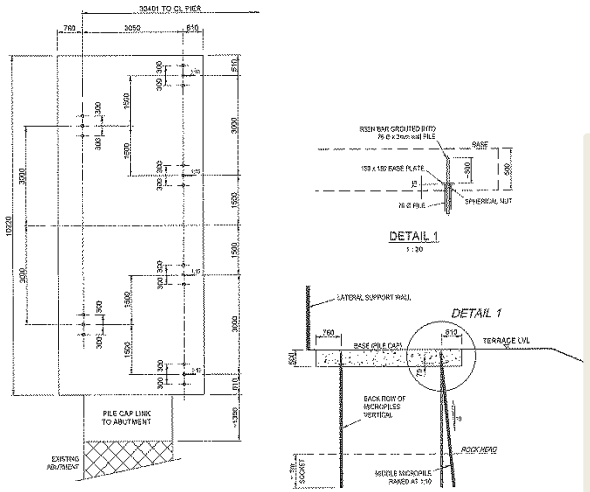
17











TEMPORARY WORKS DESIGN

NO GEOTECH INFORMATION

PERMANENT GROUND ANCHORS STRESSED TO 385kN

TEMPORARY SOIL NAIL AND SHOTCRETE WALL

MICROPILES TO SUPPORT SLIDE PATH 250 kN CAPACITY

SEMI-CIRCULAR SHAFT TO ACCESS FOUNDATION

NOTES

SCHEDULE OF QUANTITIES

Description	Hoedspruit Abutment	Phalaborwa Abutment	TOTAL
R32N x 3m soil nails	6	7	13
R32N x 6m soil nails	6	6	12
R32N x 9m soil nails	10	6	16
R32N x 10m soil nails	3	6	9
75mm Gunite + Mesh Ref 245	111	104	215m2
R32N i 700 Micropiles (250kN)	18	18	36
R51N hollow bar x 12m	6	6	12

NOTE

THE DESIGN OF THE LATERAL SUPPORT HAS BEEN UNDERTAKEN BY JONES & WAGENER (PTY) LTD ON BEHALF OF ESOR AFRICA (PTY) LTD. THESE DRAWINGS ARE THE PROPERTY OF J&W AND ESOR. THE CONCEPTS AND DETAILS SHOWN ON THIS DRAWING MAY NOT BE COPIED OR COMMUNICATED TO A THIRD PARTY WITHOUT THE WRITTEN CONSENT OF BOTH ESOR AND J&W.

esor africa (pty) ltd

Jones & Wagener Consulting Civil Engineers

Drawn	Surname	HURLEY	29.4.2011
Designed	Surname	PARDLE	29.4.2011
Checked	Surname	PARDLE	5.5.2011
Approved	Designation	PARDLE	5.5.2011
Scale	Sheet	AS SHOWN	

ESOR AFRICA (PTY) LTD

BRAKSPRUIT RAIL BRIDGE
JACKING TEMPORARY WORKS
LATERAL SUPPORT
LAYOUT & DETAILS

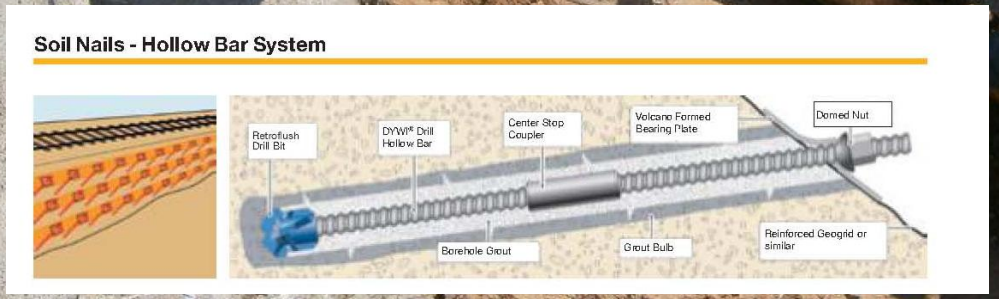
C863-00-001

Revision 3 A0

	3	NORTH ABUTMENT REVISED	HURLEY	18.7.2011
	2	SOUTH ABUTMENT REVISED - NORTH DIR HOLD	HURLEY	6.7.2011
	1	JACKING ON WESTERN SIDE OF BRIDGE, FOUNDATION AT SOUTH WAS REVISED	HURLEY	15.6.2011
R&O - BRAKSPRUIT - JOINT CONCR PLINTHS - LOAD & DESIGN DATA	0	ISSUED FOR APPROVAL / CONSTRUCTION	HURLEY	5.5.2011
Reference Drawings / Korrespondensie	Rev	Revision / Hersiening	Drawn	Approved

INSTALLATIONS OF ANCHORS

DETAIL OF HOLLOW STEM SELF DRILLING ANCHOR

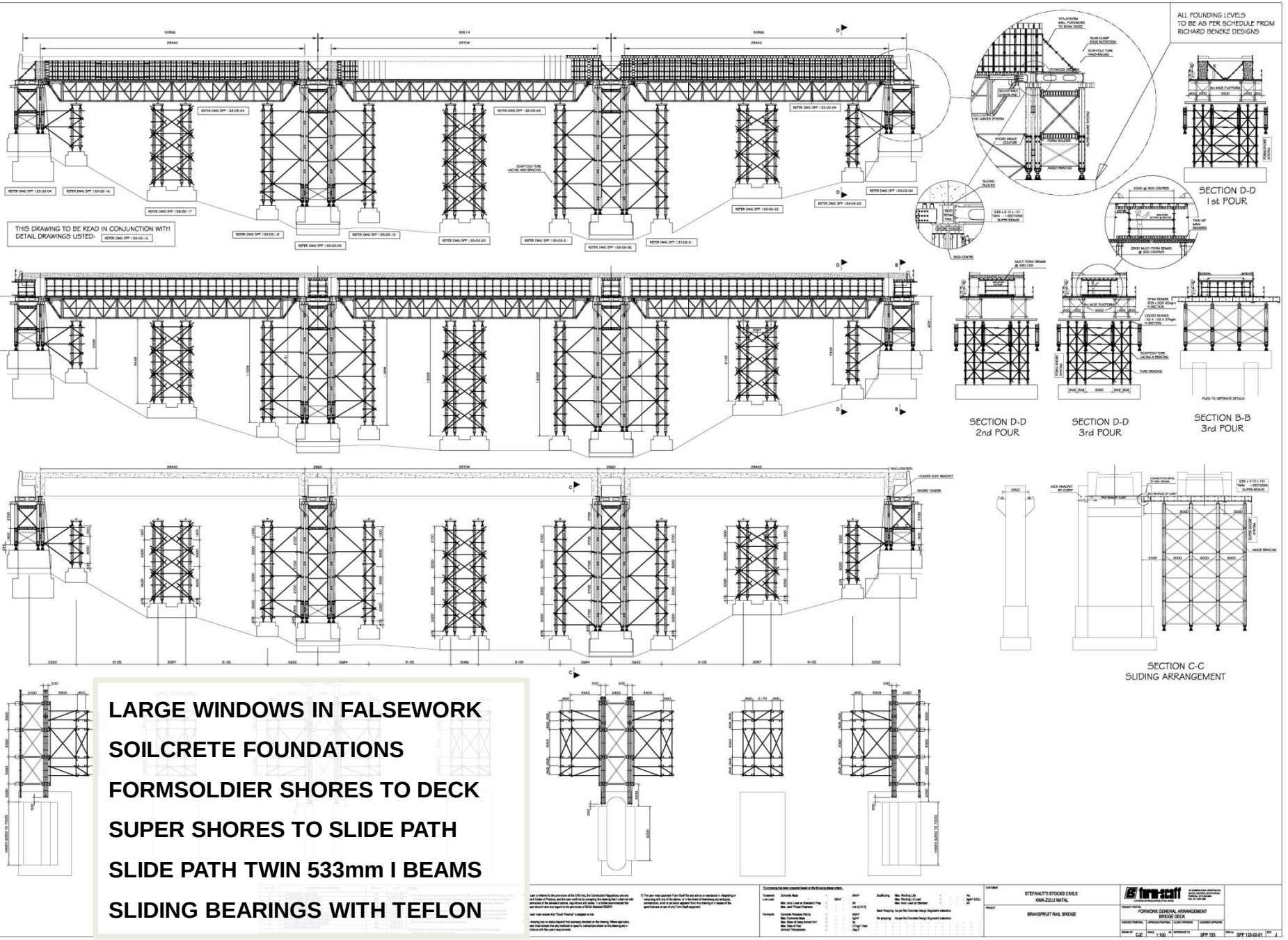




TEMPORARY SOIL NAIL AND SHOTCRETE WALL

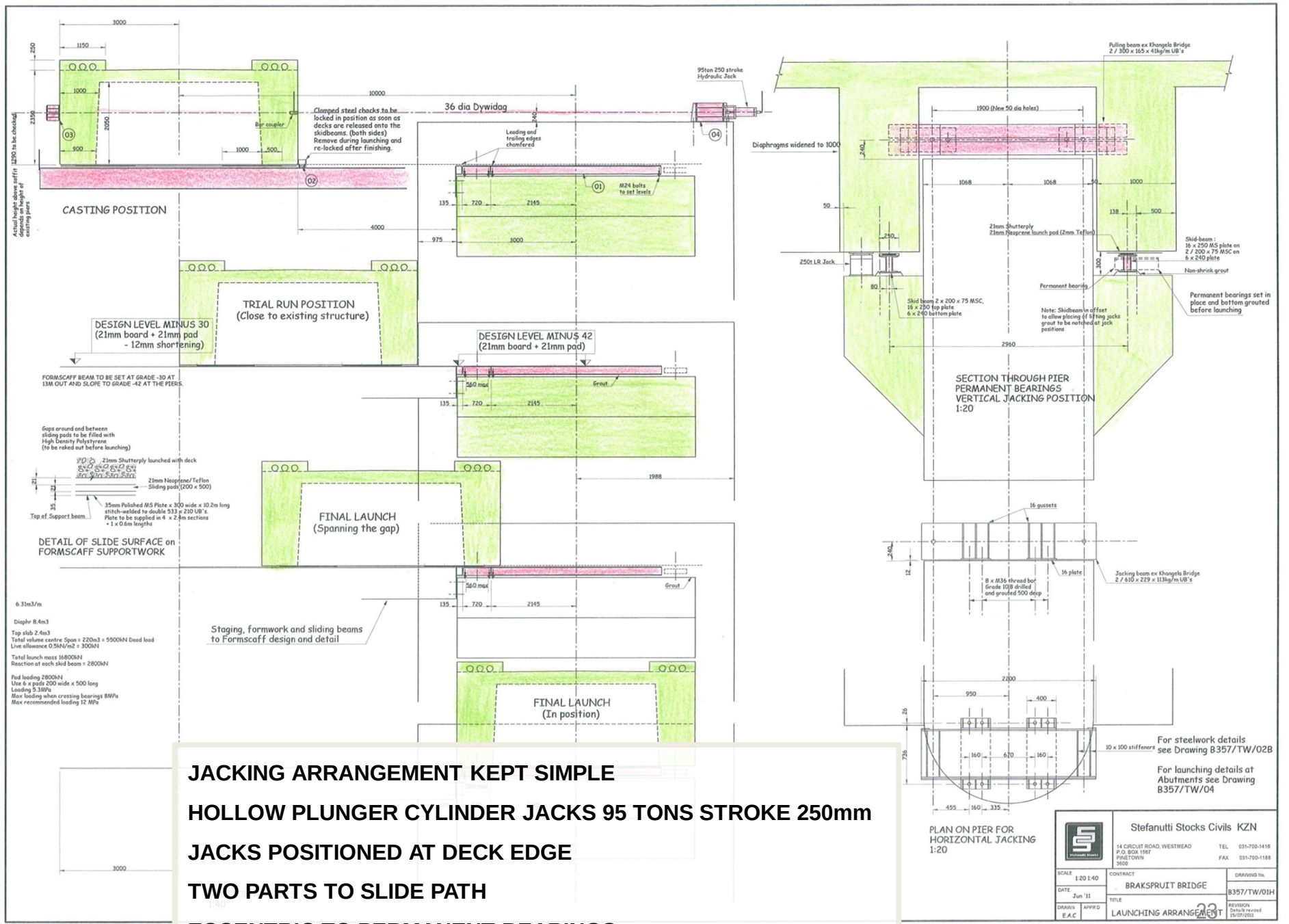
PILECAP TO SUPPORT SLIDE PATH

SEMI-CIRCULAR SHAFT TO ACCESS FOUNDATION


ALL FOUNDING LEVELS
TO BE AS PER SCHEDULE FROM
RICHARD BENEKE DESIGNS
THIS DRAWING TO BE READ IN CONJUNCTION WITH
DETAIL DRAWINGS LISTED:
SECTION D-D
1st POUR
SECTION D-D
2nd POUR
SECTION D-D
3rd POUR
SECTION B-B
3rd POUR
SECTION C-C
SLIDING ARRANGEMENT
LARGE WINDOWS IN FALSEWORK
SOILCRETE FOUNDATIONS
FORMSOLDIER SHORES TO DECK
SUPER SHORES TO SLIDE PATH
SLIDE PATH TWIN 533mm I BEAMS
SLIDING BEARINGS WITH TEFLON
STEFANUTTI STOCKS CIVILS
KWA-ZULU NATAL
BRAKSPRUIT RAIL BRIDGE
FORWORK GENERAL ARRANGEMENT
BRIDGE DECK
SPP 133
SPP 133-02-01



ERECTION OF FALSEWORK



JACKING ARRANGEMENT KEPT SIMPLE

HOLLOW PLUNGER CYLINDER JACKS 95 TONS STROKE 250mm

JACKS POSITIONED AT DECK EDGE

TWO PARTS TO SLIDE PATH

ECCENTRIC TO PERMANENT BEARINGS

PDF created with pdfFactory trial version www.pdffactory.com


CORBEL CONSTRUCTION
SLIDE PATH


SPAN 2 CONSTRUCTED FIRST
FORMWORK PREASSEMBLED



REMOTE SITE

DELIVERY PROBLEMATIC

1000 CUBIC METRES OF CONCRETE

SPECIAL CONCRETE MIXES


650 TON CRAWLER CRANE
LARGEST SINGLE COST TO PROJECT
ONE WEEK TO ERECT
ANGLO-V3
GROVE 5170
sarens
sarens
sarens



REMOVING TEMPORARY STRUCTURE AT START OF OCCUPATION



LARGEST LIFT 100 TON TRUSS FROM SPAN 1



JACKS SUPPORTED ON JACKING FRAME

SINGLE HYDRAULIC POWERPACK

SYNCHRONISED MOVEMENT



SAFETY GIVEN HIGHEST PRIORITY

SPECIFIC TRAINING FOR LAUNCH

130 000 HOURS WORKED WITH NO SERIOUS INJURIES



LAUNCH IN PROGRESS

PAD FEEDING OVER PERMANENT BEARING

SIDE GUIDES INEFFECTIVE

DECK JACKED VERTICALLY TO CORRECT ALIGNMENT


DECK IN FINAL POSITION
MAX JACKING FORCE 135 TONS


INSTALLATION OF PERWAY



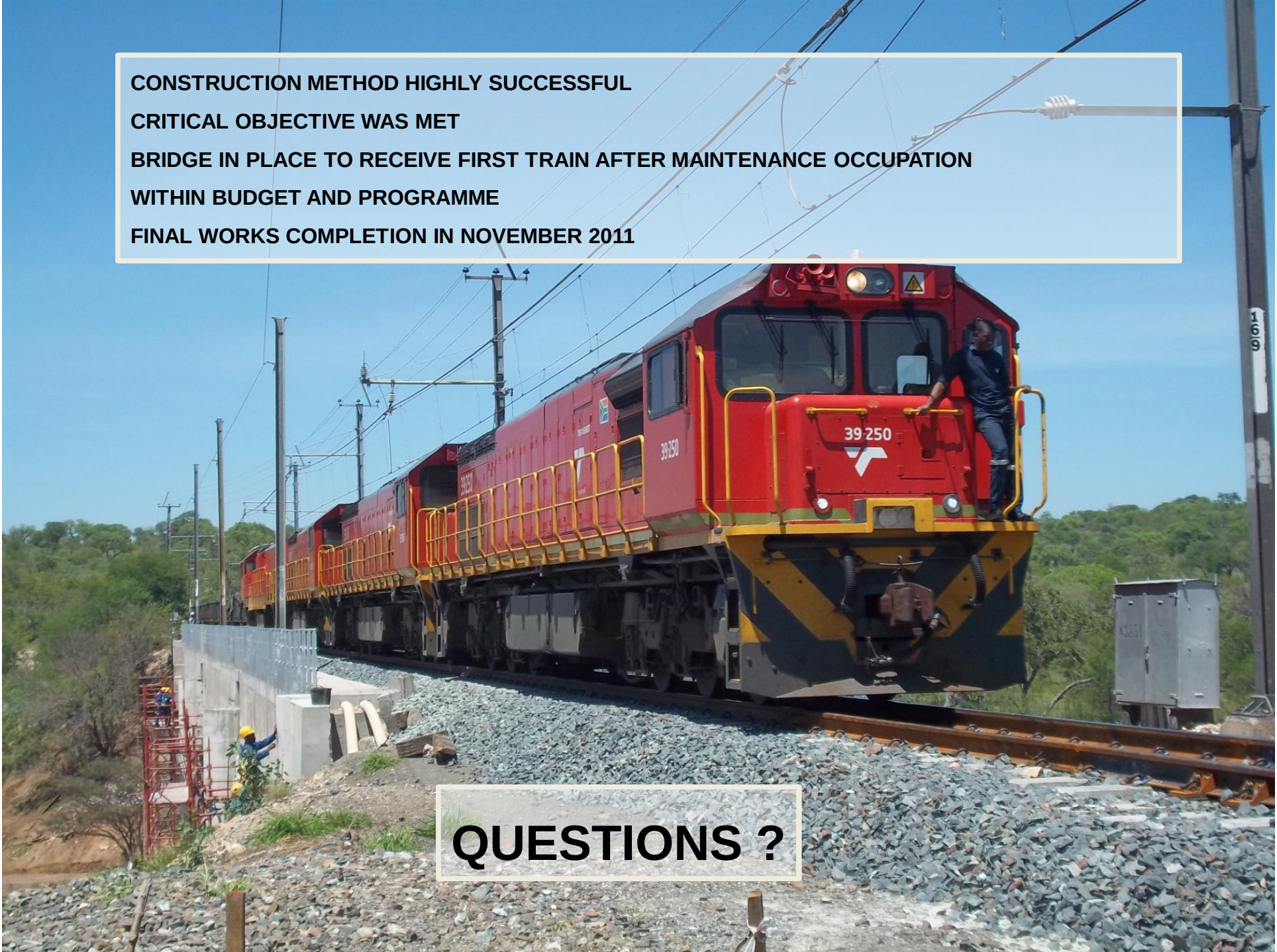
CHALLENGES DURING CONSTRUCTION

REMOTE SITE

STEEL INDUSTRY STRIKE

COMPLEXITY OF TEMPORARY WORK – DIFFERENTIAL SETTLEMENT

ACCELERATION VERY DIFFICULT



CONSTRUCTION METHOD HIGHLY SUCCESSFUL

CRITICAL OBJECTIVE WAS MET

BRIDGE IN PLACE TO RECEIVE FIRST TRAIN AFTER MAINTENANCE OCCUPATION

WITHIN BUDGET AND PROGRAMME

FINAL WORKS COMPLETION IN NOVEMBER 2011

QUESTIONS ?