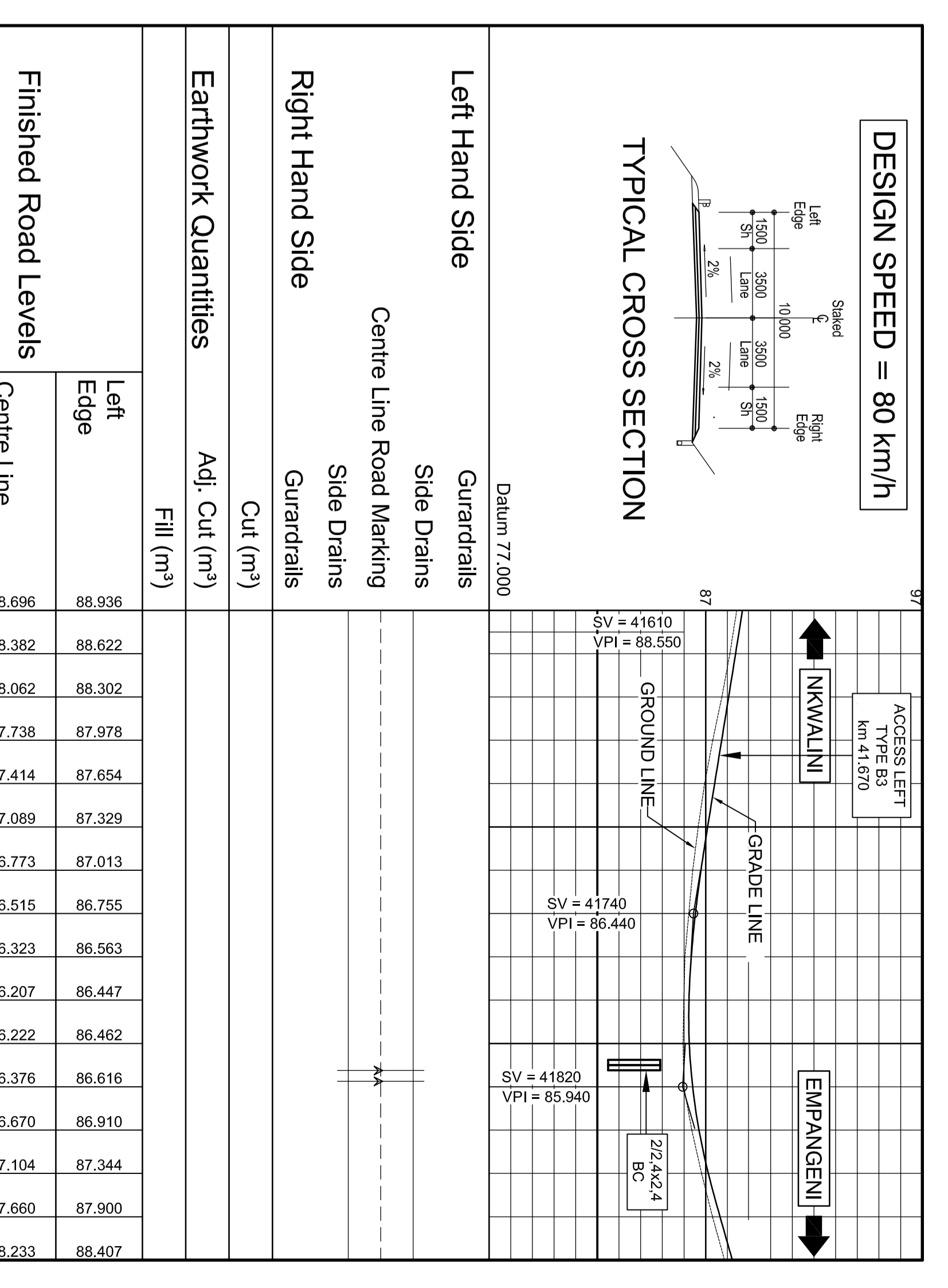
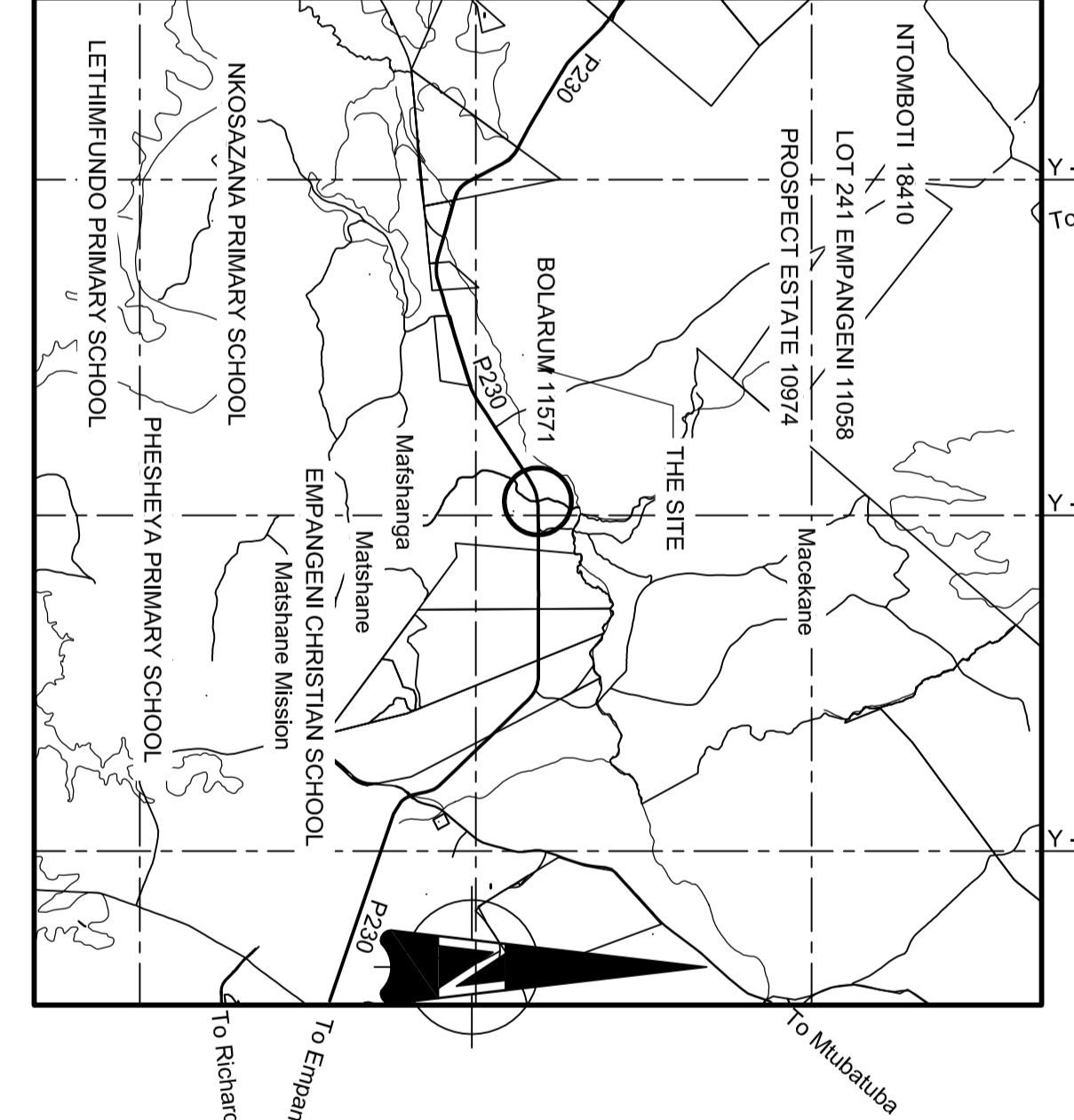
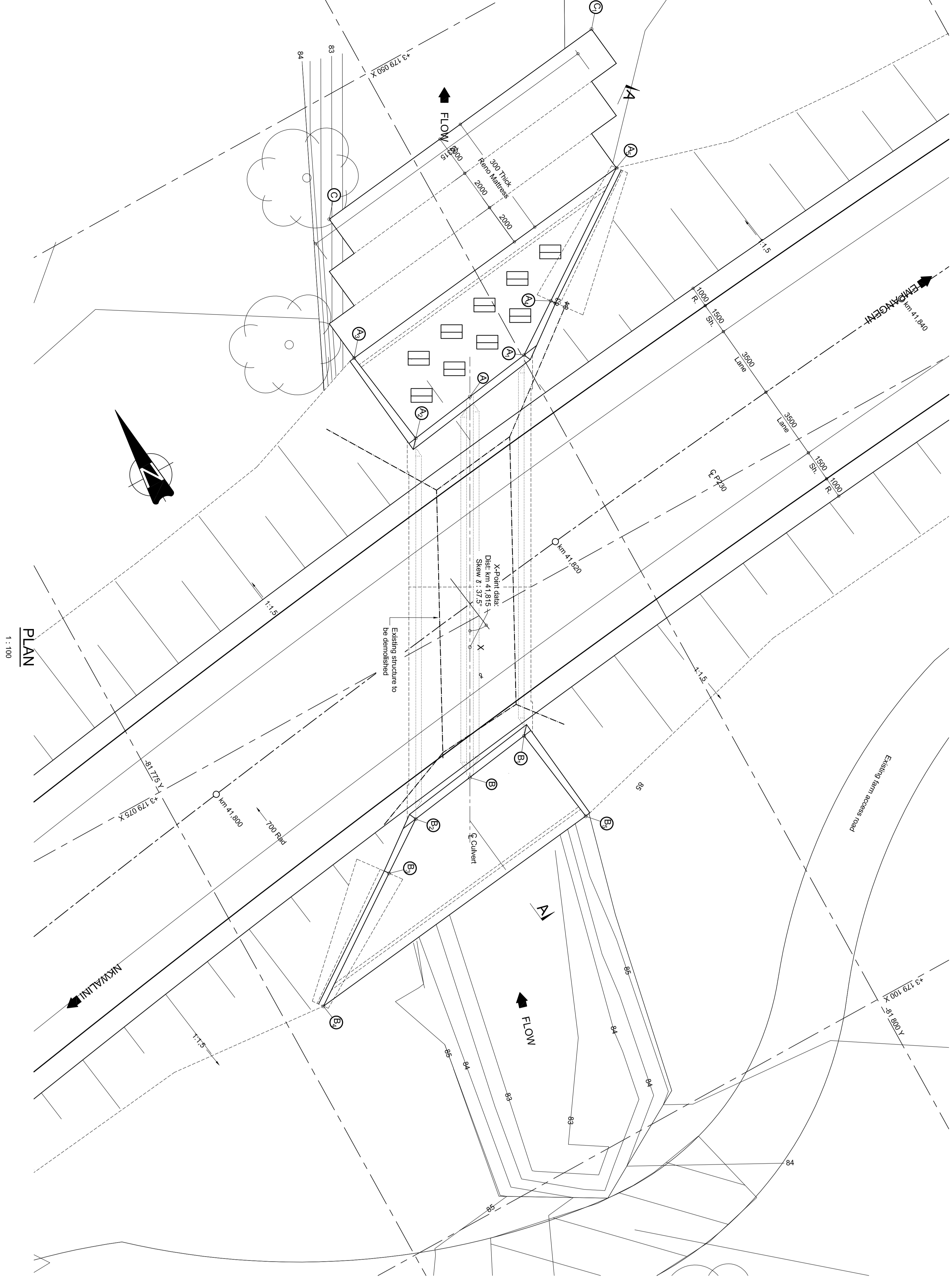
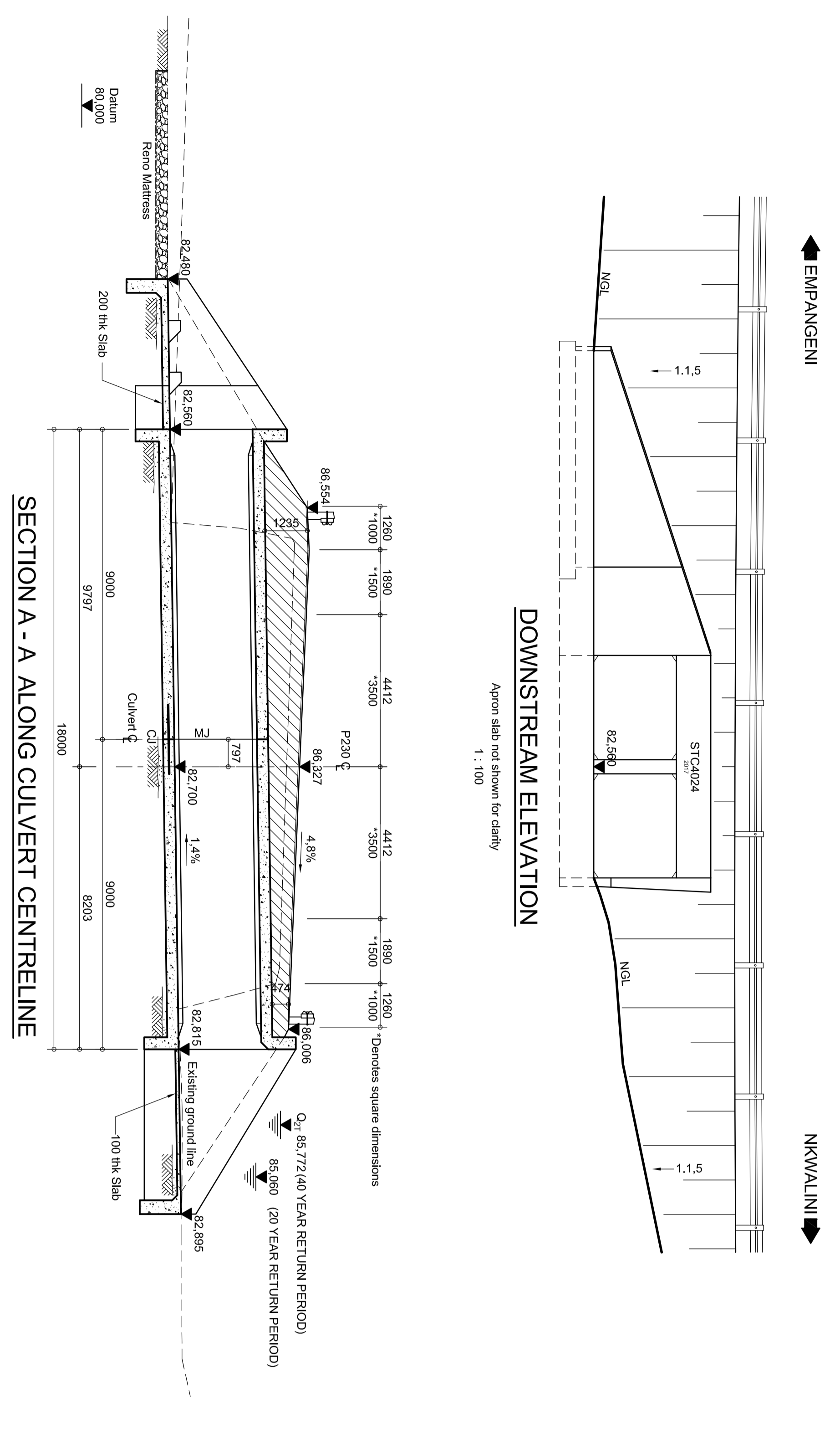
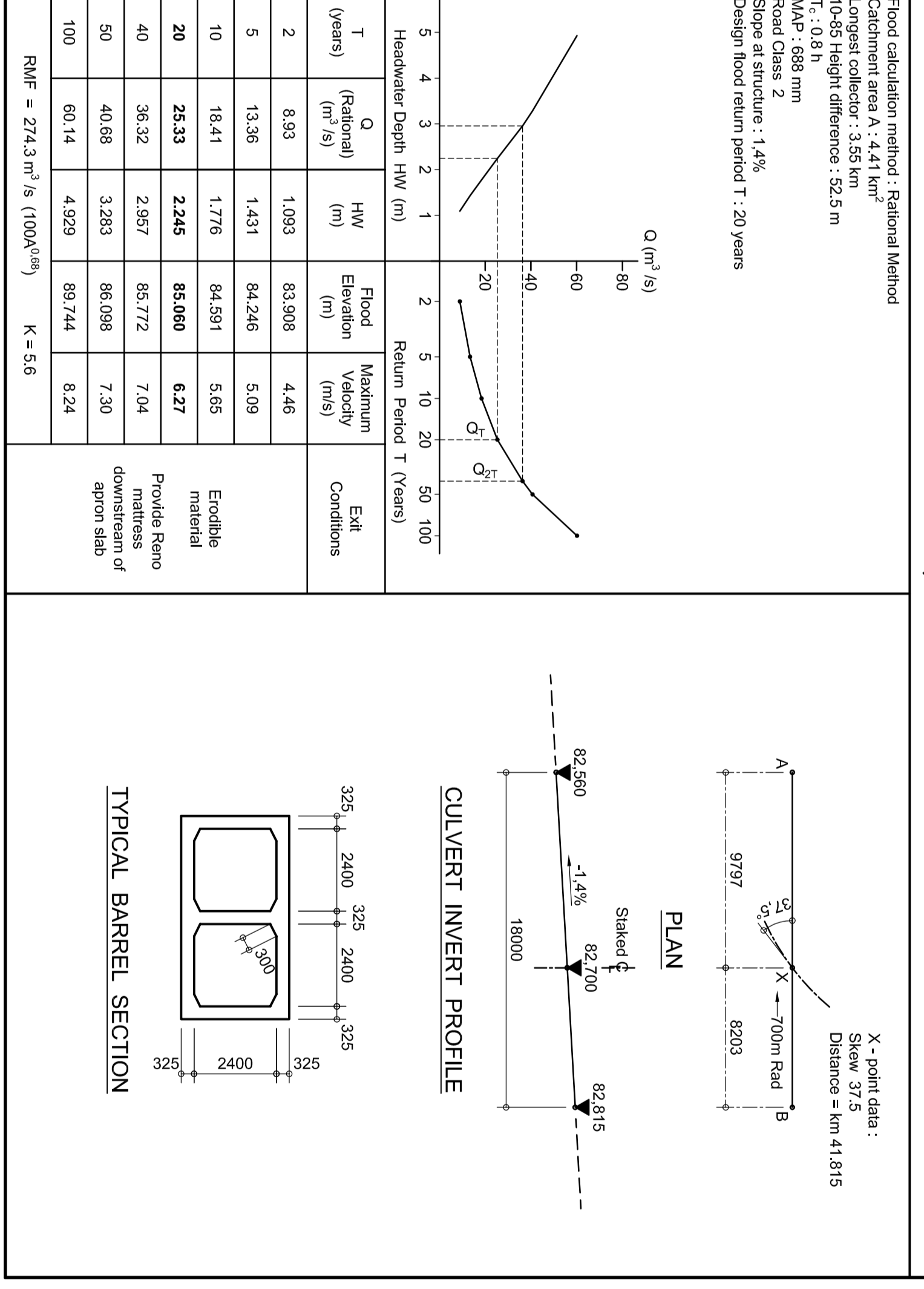


**SUMMARY OF HYDROLOGIC, HYDRAULIC & GEOMETRIC DATA**



**DESIGN SPEED = 80 km/h**

Station	Left Hand Side	Centre Line Road Marking	Right Hand Side
41600	88.433	88.456	88.936
41620	88.118	88.142	88.382
41640	87.747	87.822	88.002
41660	87.327	87.498	87.738
41680	86.950	87.174	87.654
41700	86.656	86.849	87.089
41720	86.404	86.533	86.773
41740	86.220	86.275	86.515
41760	86.042	86.063	86.323
41780	85.991	85.967	86.207
41800	85.956	85.962	86.222
41820	85.992	86.136	86.376
41840	86.359	86.430	86.670
41860	86.611	86.664	87.104
41880	87.315	87.420	87.660
41900	87.871	88.059	88.233

**SCHEDULE OF DRAWINGS**

Drawing No.	Description
ST/C024 / 1	General Arrangement
ST/C024 / 2	Barrel Details
ST/C024 / 3	Embed Details
ST/C024 / 4	Wingwall Details
ST/C024 / 5	Schedule of Reinforcement

**WGS 84 LO 31° CO-ORDINATES**

Point	Y	X
A	-81 796.913	+3 179 065.728
A <sub>1</sub>	-81 900.107	+3 179 065.245
A <sub>2</sub>	-81 793.220	+3 179 065.210
A <sub>3</sub>	-81 793.905	+3 179 061.480
A <sub>4</sub>	-81 802.454	+3 179 063.613
A <sub>5</sub>	-81 808.205	+3 179 059.610
X	-81 792.150	+3 179 074.305
B	-81 788.150	+3 179 081.485
B <sub>1</sub>	-81 791.400	+3 179 081.000
B <sub>2</sub>	-81 794.500	+3 179 081.965
B <sub>3</sub>	-81 782.550	+3 179 083.600
B <sub>4</sub>	-81 778.500	+3 179 087.600
B <sub>5</sub>	-81 782.100	+3 179 085.733
C	-81 796.500	+3 179 065.150
C <sub>1</sub>	-81 810.500	+3 179 063.300

**NOTES**

- Design prepared in accordance with the KZN Department of Transport Design Manual for Standard Box Culverts.
- Landings  
 The landing is in accordance with TMH 7 : Parts 1 & 2 : 1981 (Revised December 1989). The following loading and design variables have been used:  
 2.1 Design load : Reinforced Concrete - 24kN/m<sup>2</sup>  
 2.2 Design load : Reinforced Concrete - 24kN/m<sup>2</sup>  
 2.3 Earth Pressure behind Erection & Barrel Walls based on Coulomb's theory  
 2.4 Saturation of fill not envisaged.  
 2.5 Design of fill not envisaged.  
 2.6 Design of fill not envisaged.  
 2.7 Barrel checked for Concrete Lacks.  
 2.8 Reinforcement details as per drawings.
- Design Parameters  
 3.1 Young's Modulus of Elasticity : Concrete : 20GPa  
 3.2 Reinforcing Steel : Long term Modulus : 16GPa  
 3.3 Coefficient of Thermal Expansion : 12 x 10<sup>-6</sup> / °C  
 3.4 Characteristic Strength of Materials  
 4.1 Concrete (C30) : 30 / 18  
 4.2 Steel Bar Reinforcement (R60) : 420MPa  
 4.3 Reinforced High-strength Steel : 420MPa  
 4.4 Reinforced High-strength Steel : 420MPa  
 4.5 Reinforced High-strength Steel : 420MPa
- Method of Analysis  
 The structure has been analysed elastically using slope-deflection equations for non-prismatic sections.  
 5.1.1 Reinforcement : Class F1  
 5.1.2 Exposed surfaces : Class F2  
 5.1.3 Top of barrel : Class F1  
 5.1.4 Top of walls, invert of barrel & apron : Class F2  
 5.1.5 All other concrete shall be classified to S20 x 25mm.  
 5.1.6 Concrete cover to reinforcement shall be 40mm.  
 5.1.7 Type of foundation material : Selected fill  
 5.1.8 Type of foundation material : Selected fill  
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- Construction Safety  
 6.1 The Contractor shall observe all safety requirements of the relevant legislation.  
 6.2 Special attention shall be paid to OHS Act No. 95 of 1993.  
 6.3 The Contractor shall ensure that all workers are adequately trained and instructed in the safe use of all equipment and machinery.  
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 7.00 The Contractor shall ensure that all workers are adequately trained and instructed in the safe use of all equipment and machinery.

**FOR WULA APPLICATION PURPOSES ONLY**

<p><b>AS BUILT</b></p> <p>Supervising Engineer: _____                  Date: _____</p> <p>Supervising Authority: _____                  Date: _____</p>	<p>Designed by: T. Mphahle                  Checked by: G. Visser</p> <p>Drawn by: Z. Panyani                  Checked by: B. Krogger</p> <p>File Reference: P230/6/1</p>	<p>Designed by: _____                  Checked by: _____</p> <p>Drawn by: _____                  Checked by: _____</p> <p>File Reference: _____</p>	<p>Supervising Engineer: _____                  Date: _____</p> <p>Supervising Authority: _____                  Date: _____</p>
<p>Approved: _____                  Date: _____</p>	<p>Approved: _____                  Date: _____</p>	<p>Approved: _____                  Date: _____</p>	<p>Approved: _____                  Date: _____</p>

**PROVINCE OF KWAZULU-NATAL DEPARTMENT OF TRANSPORT**

**P230 NKWALINI TO EMPANGENI**

**2 / 2,4m x 2,4m BOX CULVERT GENERAL ARRANGEMENT**

**ST/C024/1**