

**NATIONAL ROAD ADMINISTRATION (ANE)
GOVERNMENT OF REPUBLIC OF MOZAMBIQUE**

**PREPARATORY SURVEY
FOR
NACALA CORRIDOR ROAD NETWORK
UPGRADING PROJECT
IN
THE REPUBLIC OF MOZAMBIQUE**

**FINAL REPORT
DRAWINGS (COMPLETION STAGE)**

MAY 2018

JAPAN INTERNATIONAL COOPERATION AGENCY

**ORIENTAL CONSULTANTS GLOBAL CO., LTD.
EIGHT-JAPAN ENGINEERING CONSULTANTS INC.
KOKUSAI KOGYO CO., LTD.**

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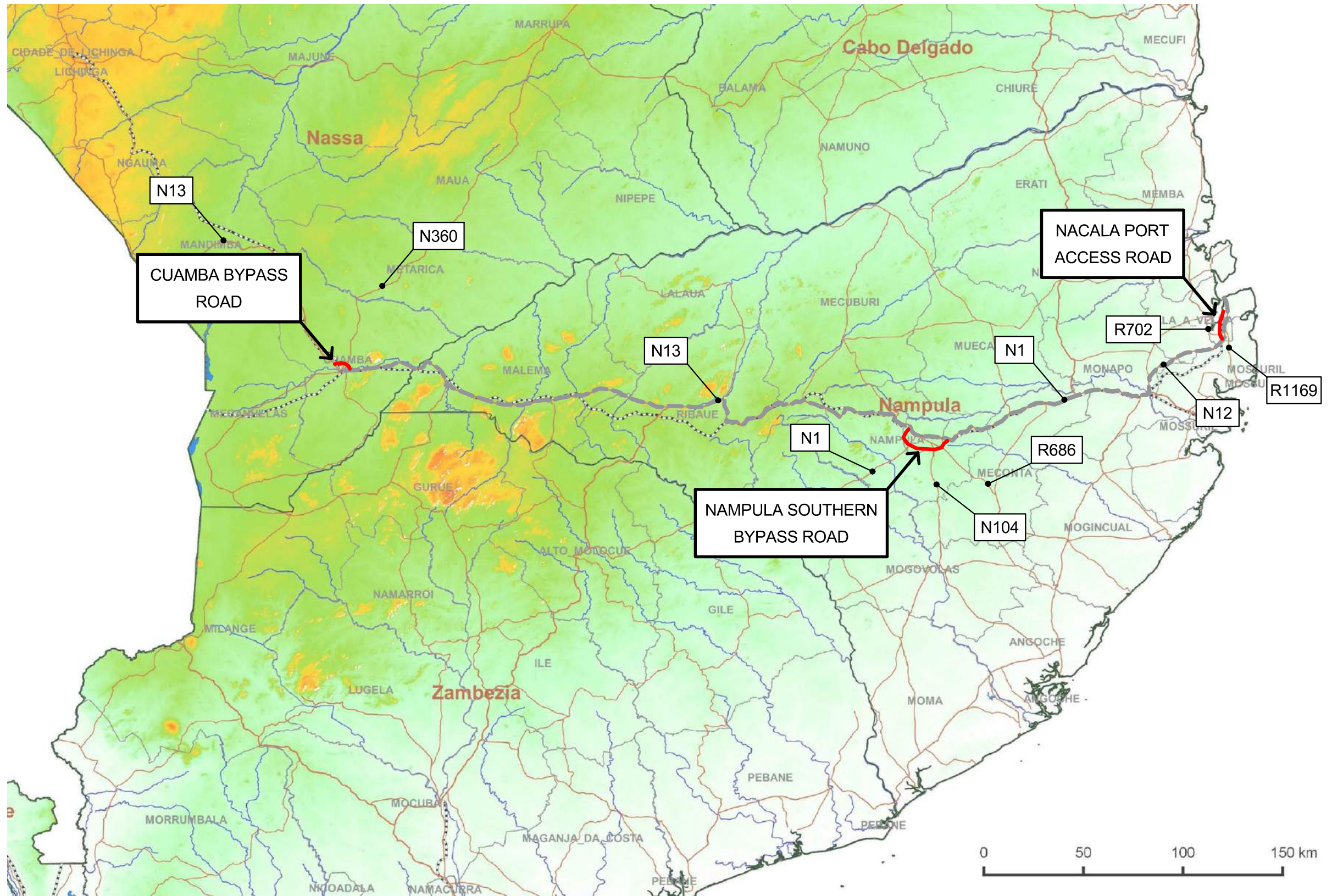
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TOTAL		22

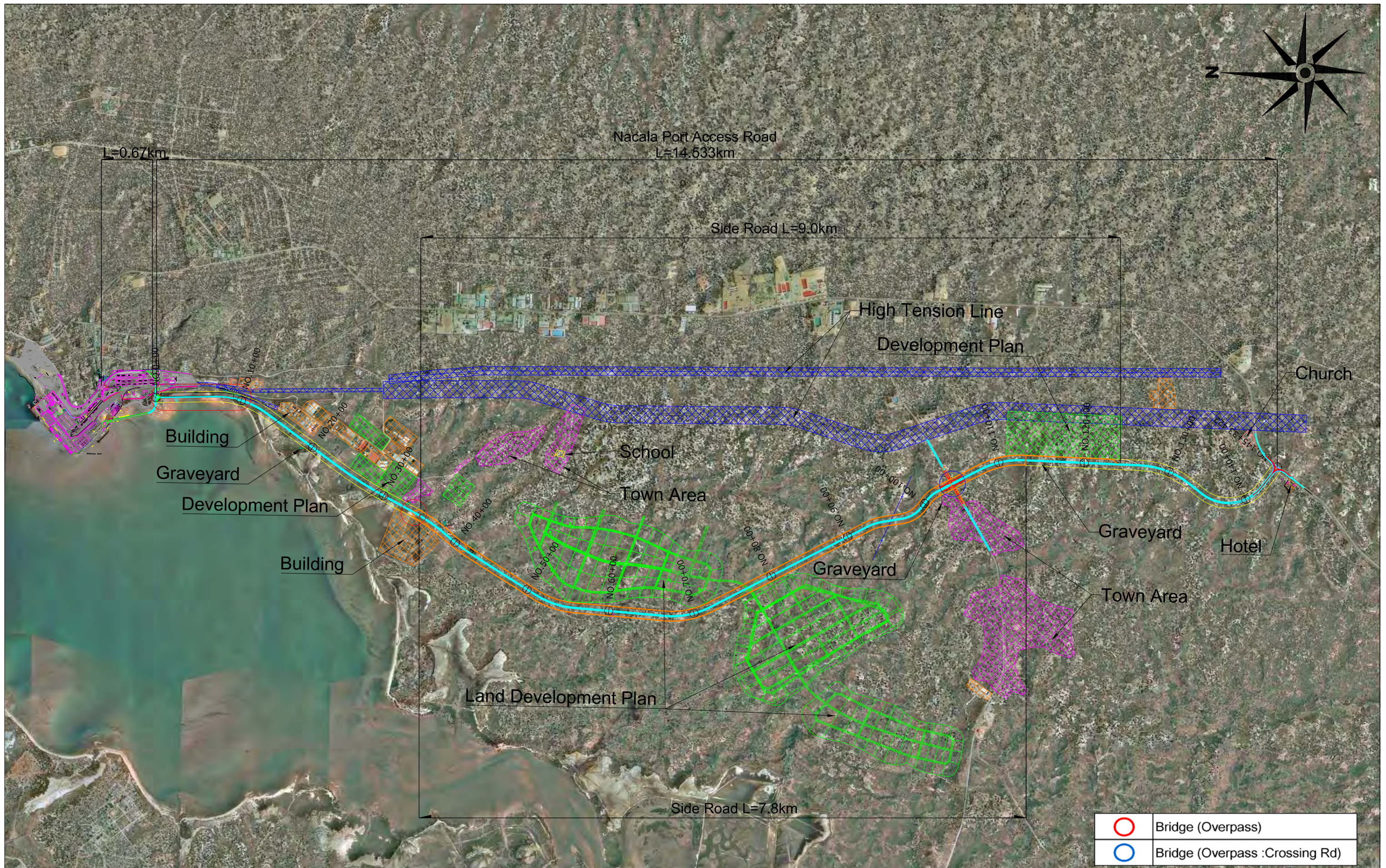
(A) GENERAL

Project Location Map

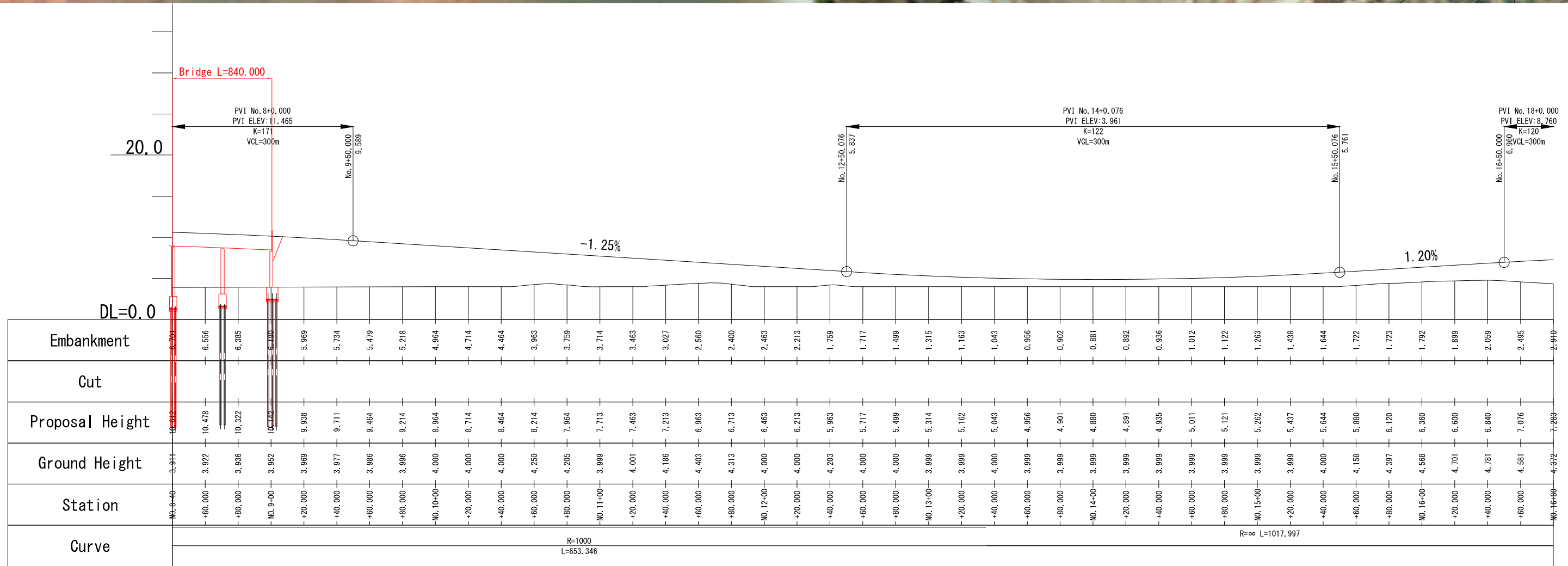


Japan International Cooperation Agency	Oriental Consultants Global Co., Ltd Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: The Preparatory Survey for Nacala Corridor Road Network Improvement Project	DRAWING TITLE: Project Location Map			
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		SIGNATURE						A-1	
National Road Administration (ANE)		DATE							

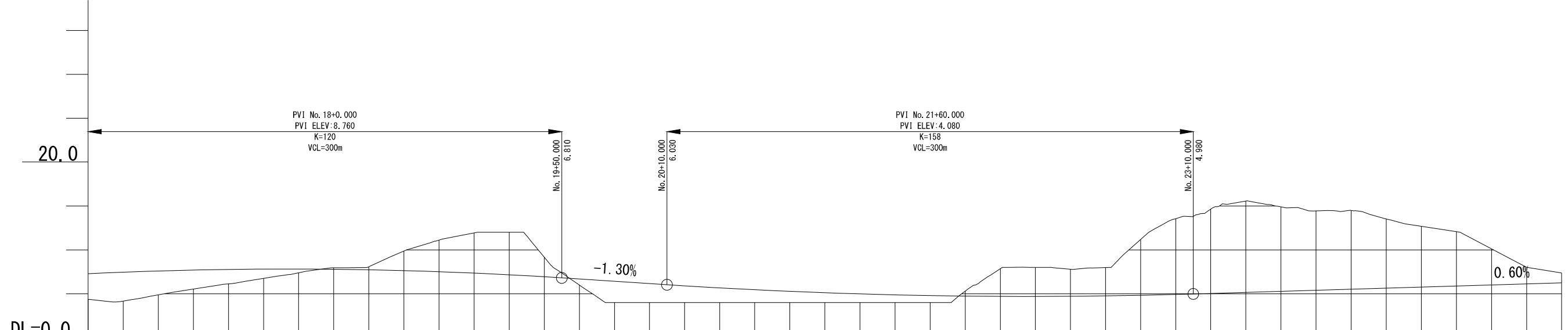
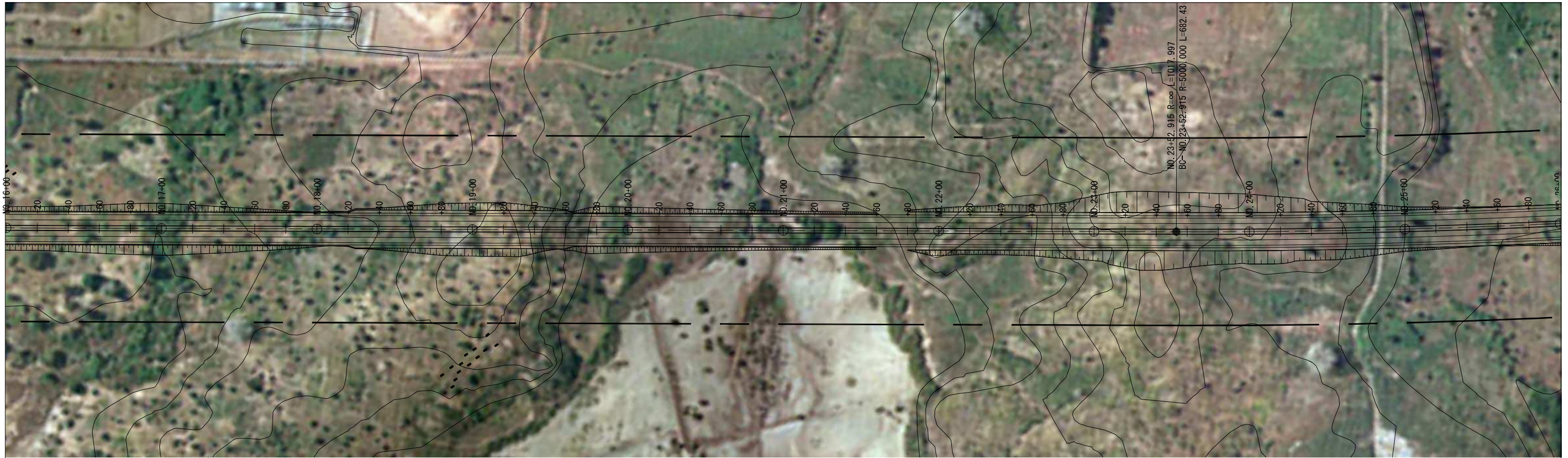
(B) NACALA PORT ACCESS ROAD



Japan International Cooperation Agency National Road Administration (ANE)	Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc.	PREPARED BY CHECKED BY APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage ROUTE MAP
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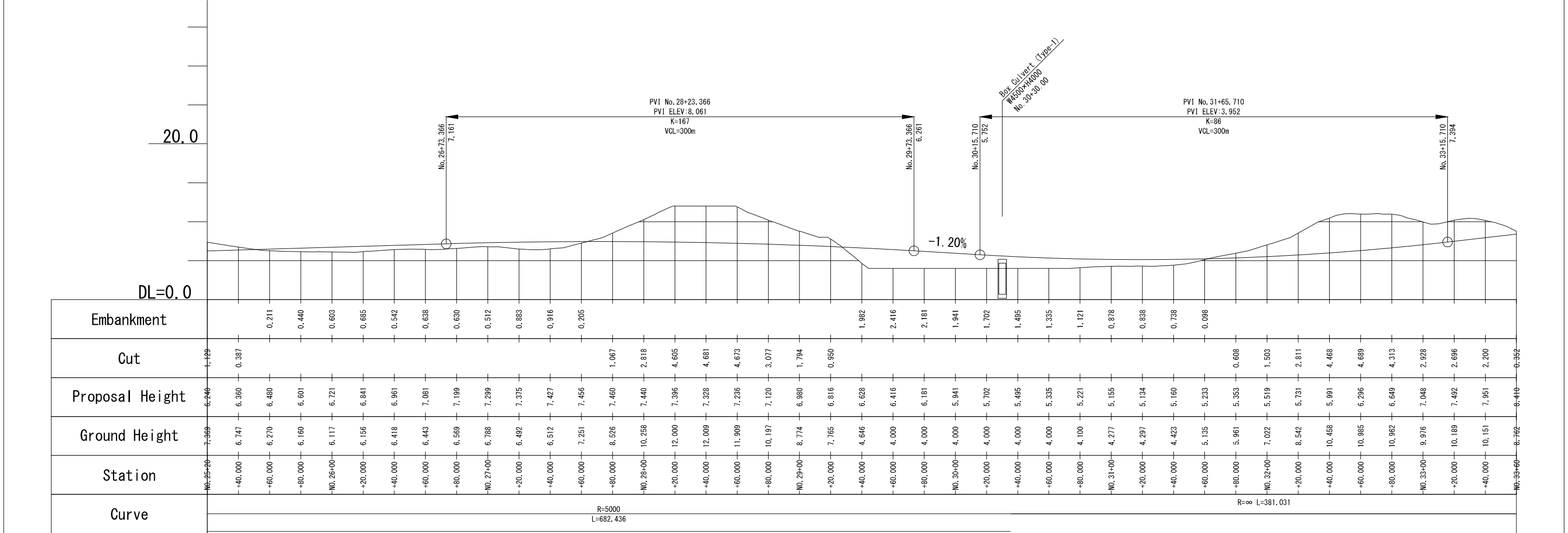
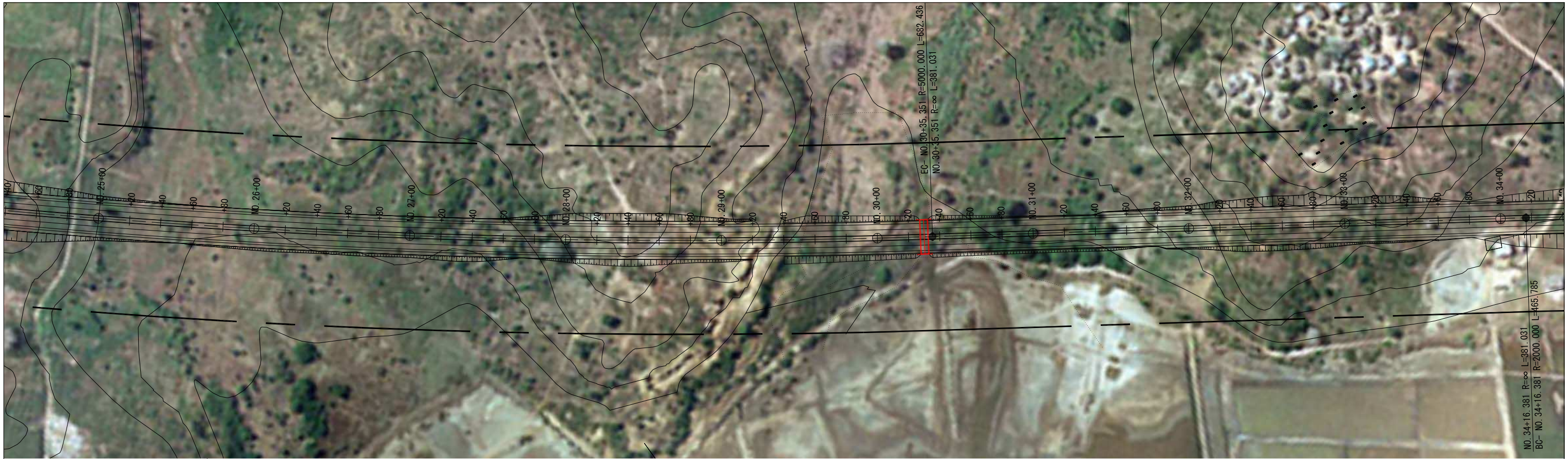


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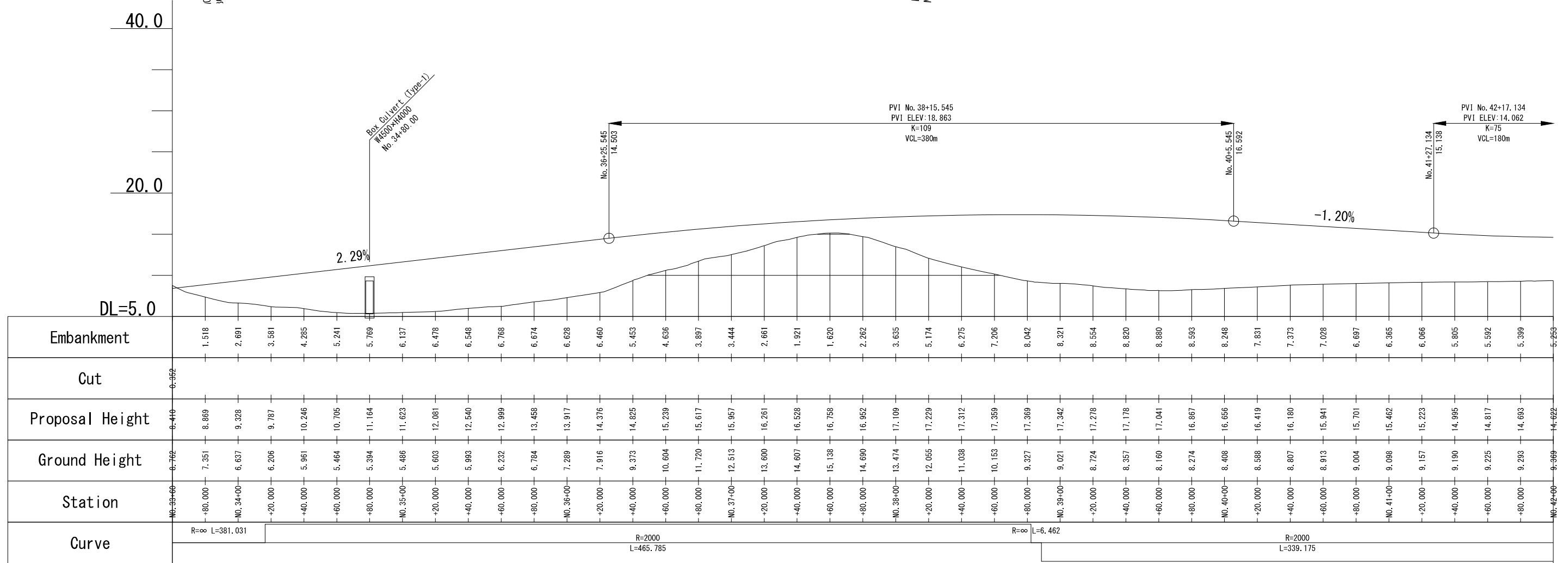


Station	Ground Height	Proposal Height	Cut	Embankment
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NO.17+00	4.158	7.456		3.297
+20,000	4.872	7.596		2.724
+40,000	5.531	7.703		2.171
+60,000	6.132	7.776		1.644
+80,000	6.756	7.816		1.060
NO.18+00	7.391	7.823		0.431
+20,000	7.959	7.796	0.163	
+40,000	8.065	7.736	0.329	
+60,000	9.868	7.643	2.225	
+80,000	11.113	7.516	3.597	
NO.19+00	11.925	7.356	4.569	
+20,000	12.000	7.163	4.837	
+40,000	9.172	6.936	2.236	
+60,000	6.004	6.680		0.676
+80,000	4.000	6.420		2.420
NO.20+00	4.000	6.160		2.160
+20,000	4.000	5.903		1.903
+40,000	4.000	5.669		1.668
+60,000	4.000	5.459		1.459
+80,000	4.000	5.275		1.275
NO.21+00	4.000	5.117		1.116
+20,000	4.000	4.983		0.983
+40,000	4.000	4.875		0.875
+60,000	4.000	4.793		0.793
+80,000	5.311	4.735	0.576	
NO.22+00	7.861	4.703	3.158	
+20,000	8.012	4.697	3.315	
+40,000	7.796	4.715	3.081	
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NO.23+00	13.542	4.923	8.619	
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+80,000	14.441	5.400	9.041	
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+40,000	12.686	5.760	6.926	
+60,000	12.066	5.880	6.185	
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NO.25+00	8.017	6.120	1.897	
NO.25+20	7.369	6.240	1.129	

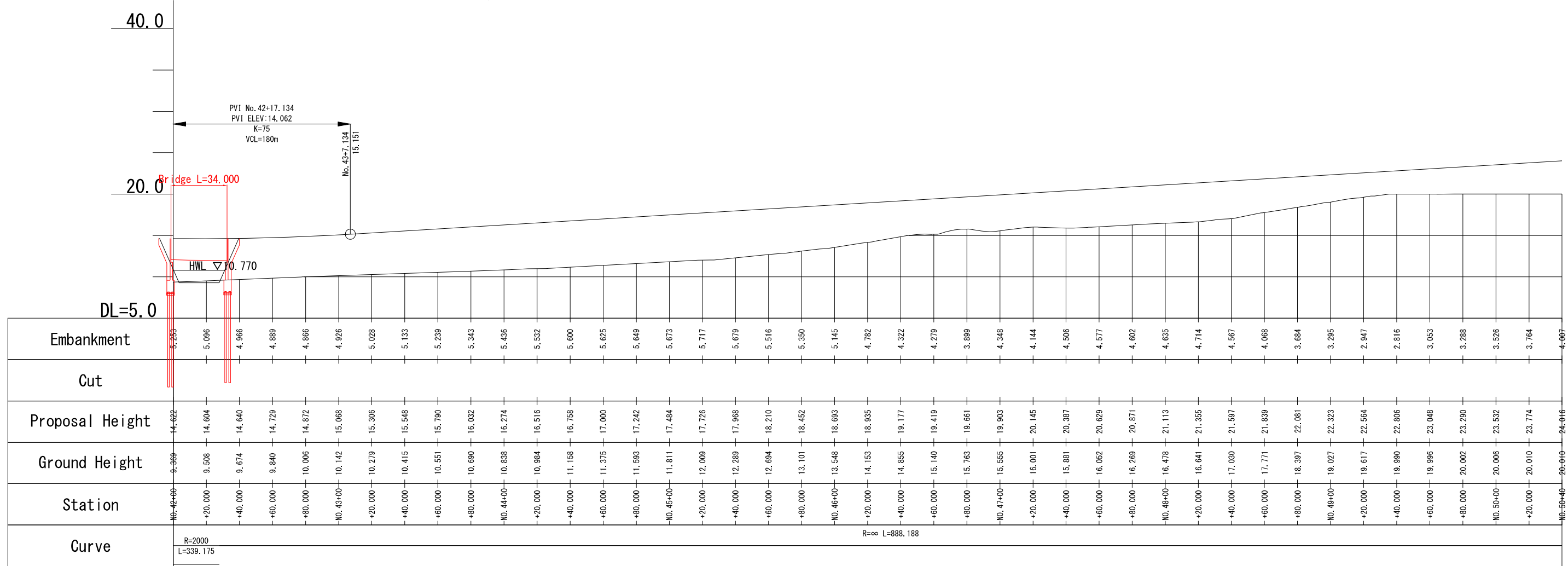
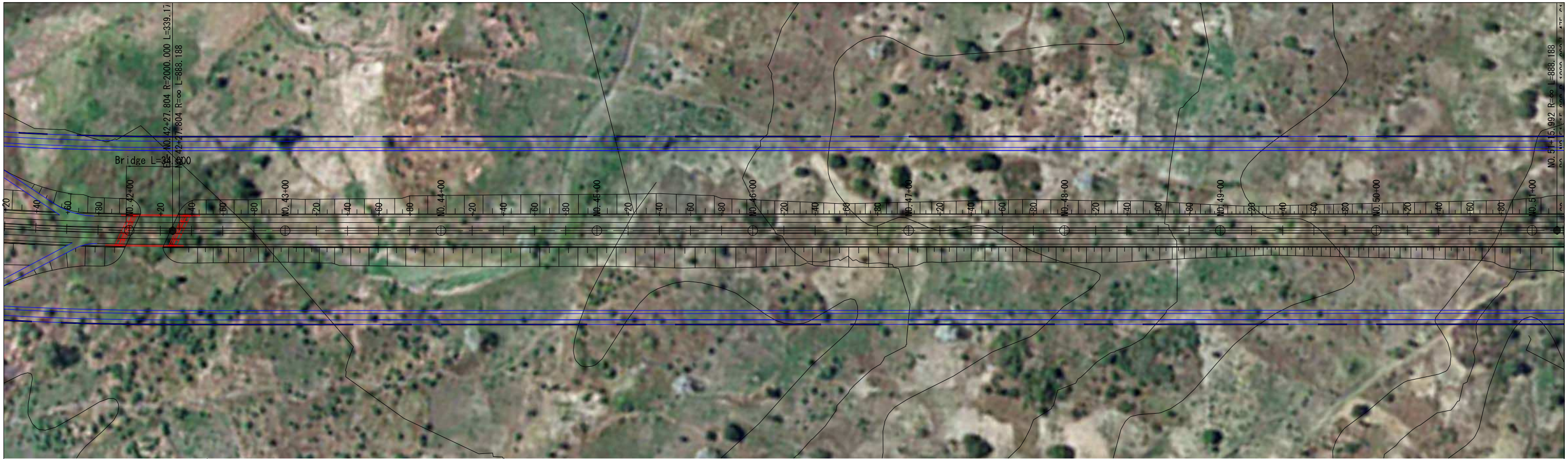
Japan International Cooperation Agency National Road Administration (ANE)	Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd.	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile			
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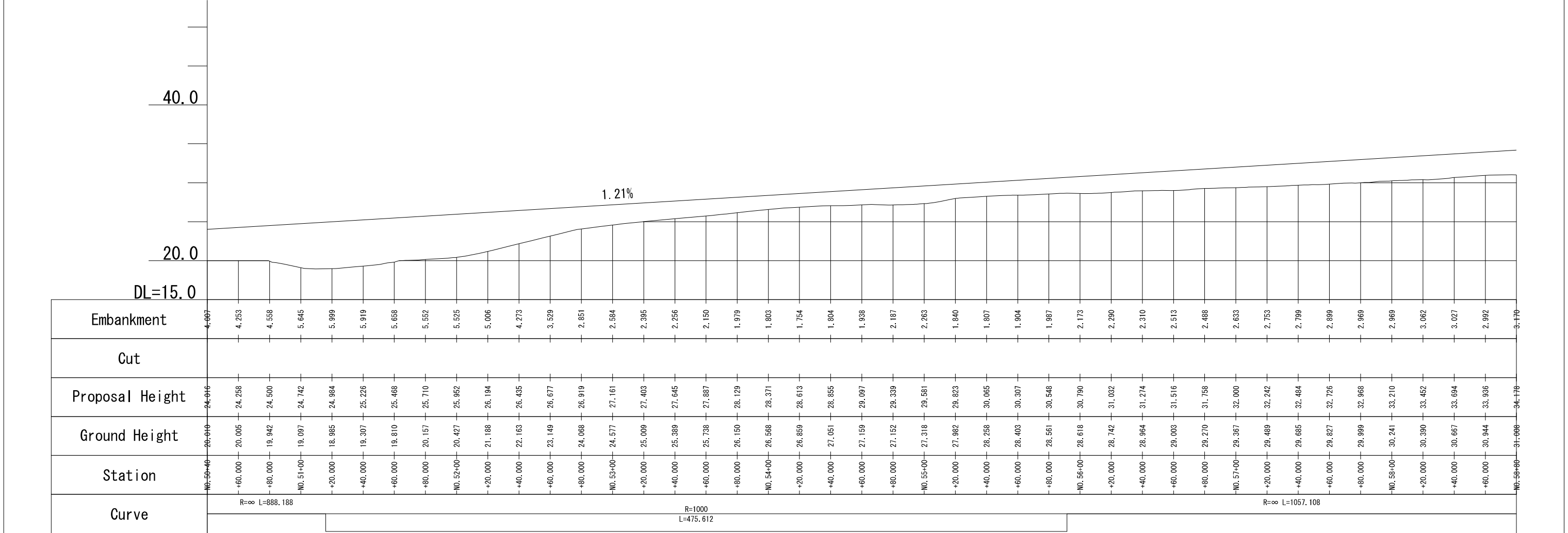
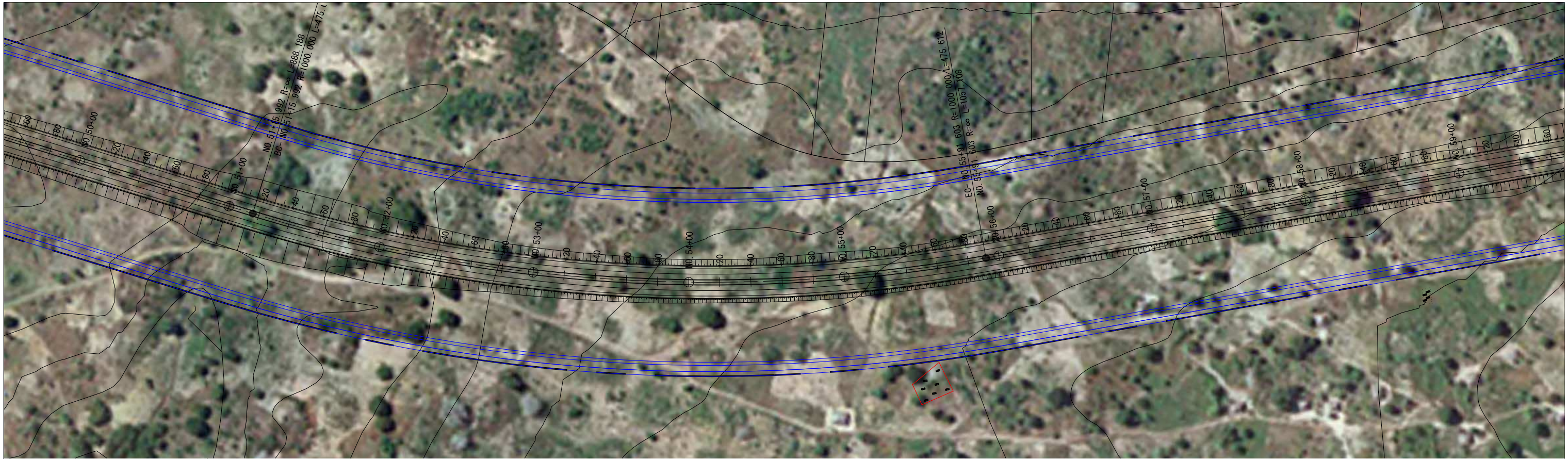
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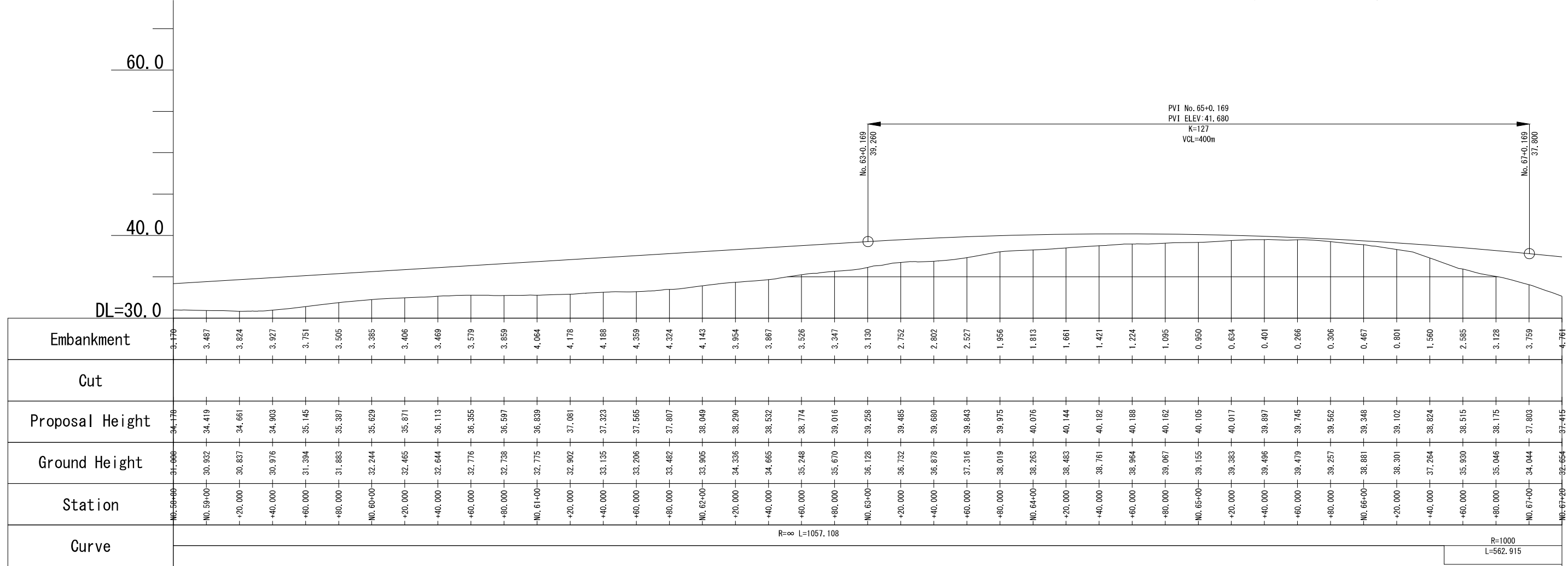
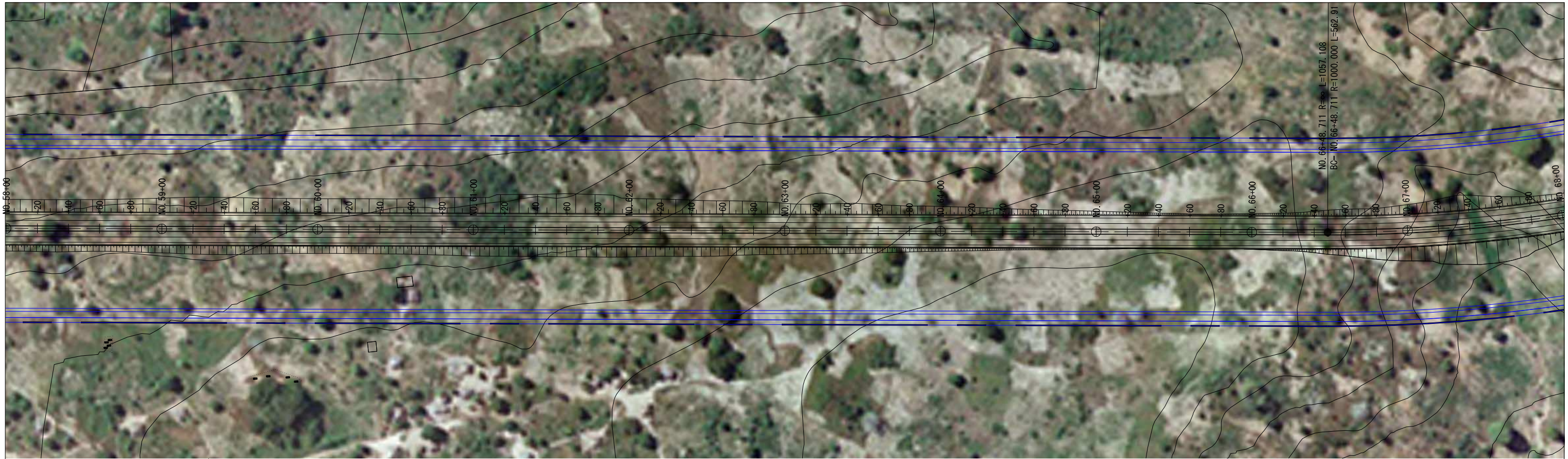
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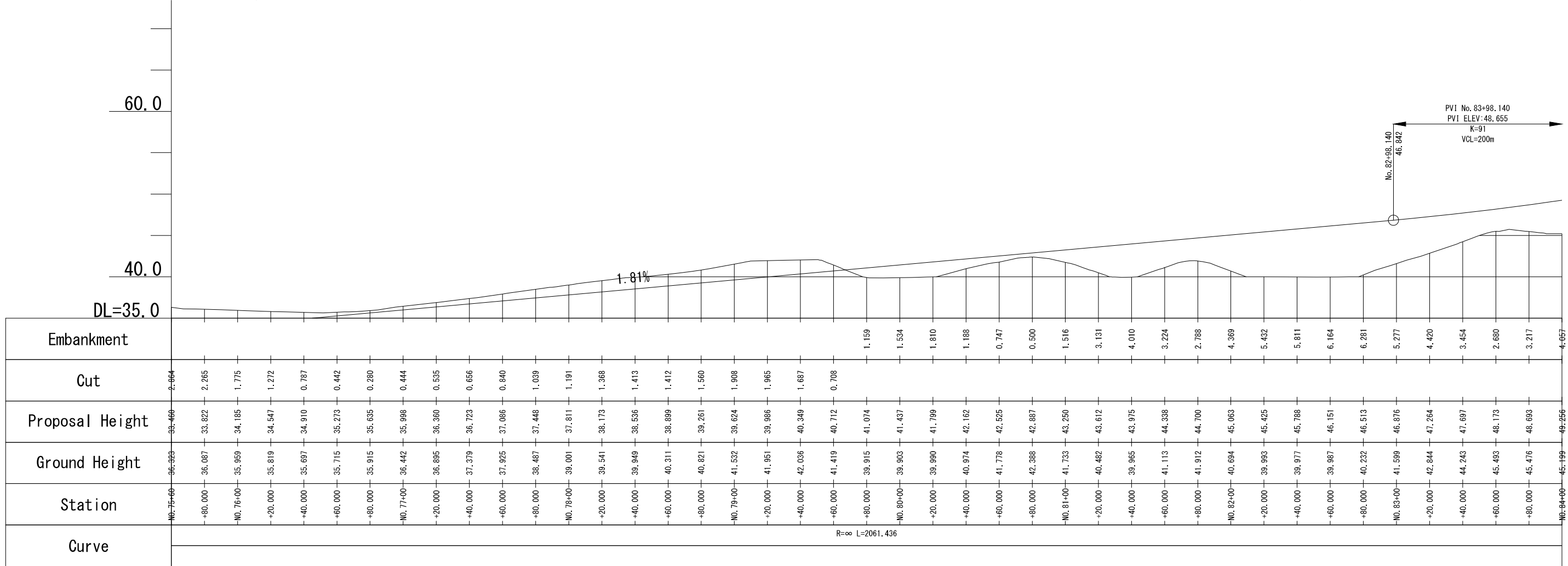
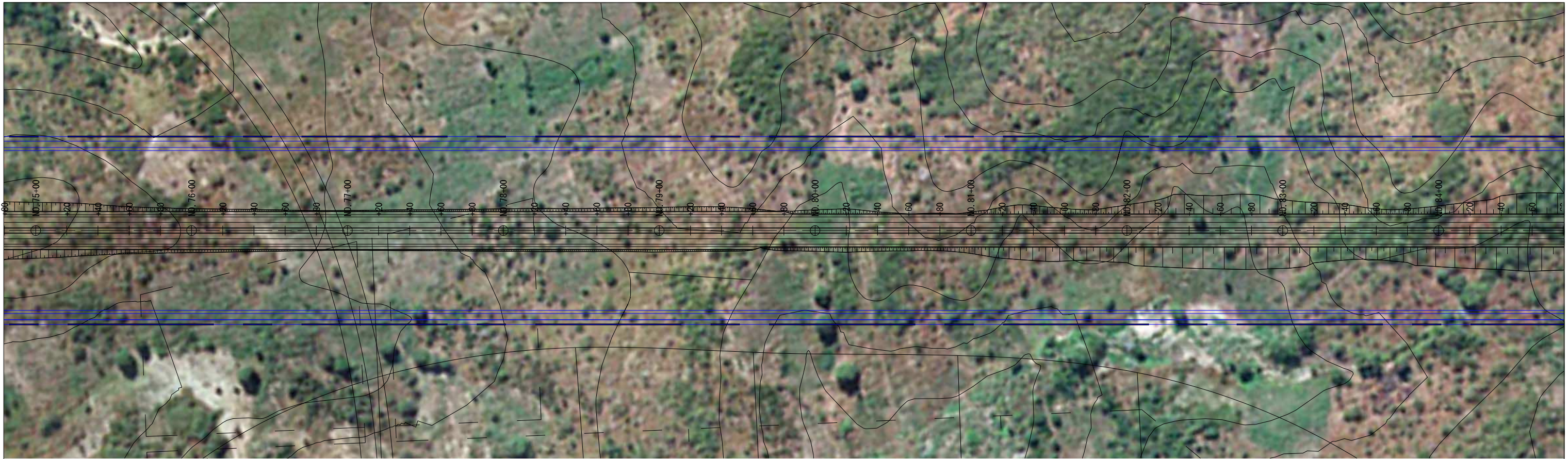
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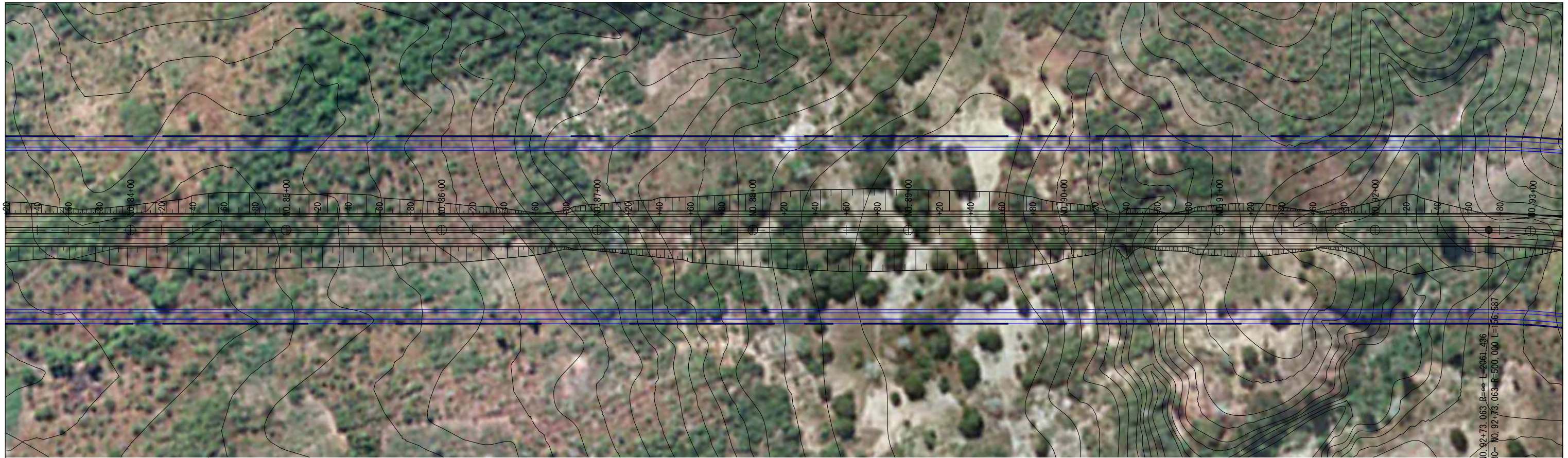
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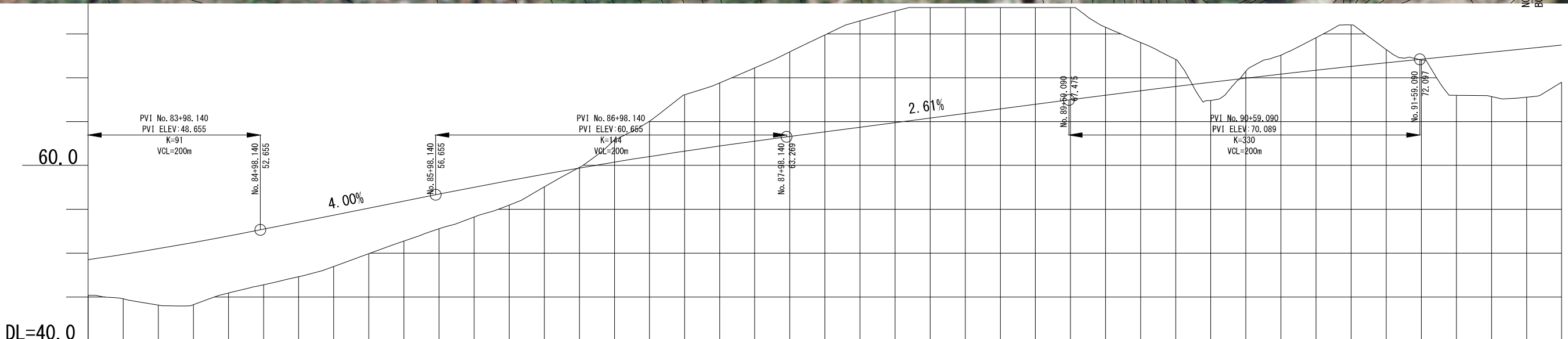
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Japan International Cooperation Agency National Road Administration (ANE)	Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd.	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile			
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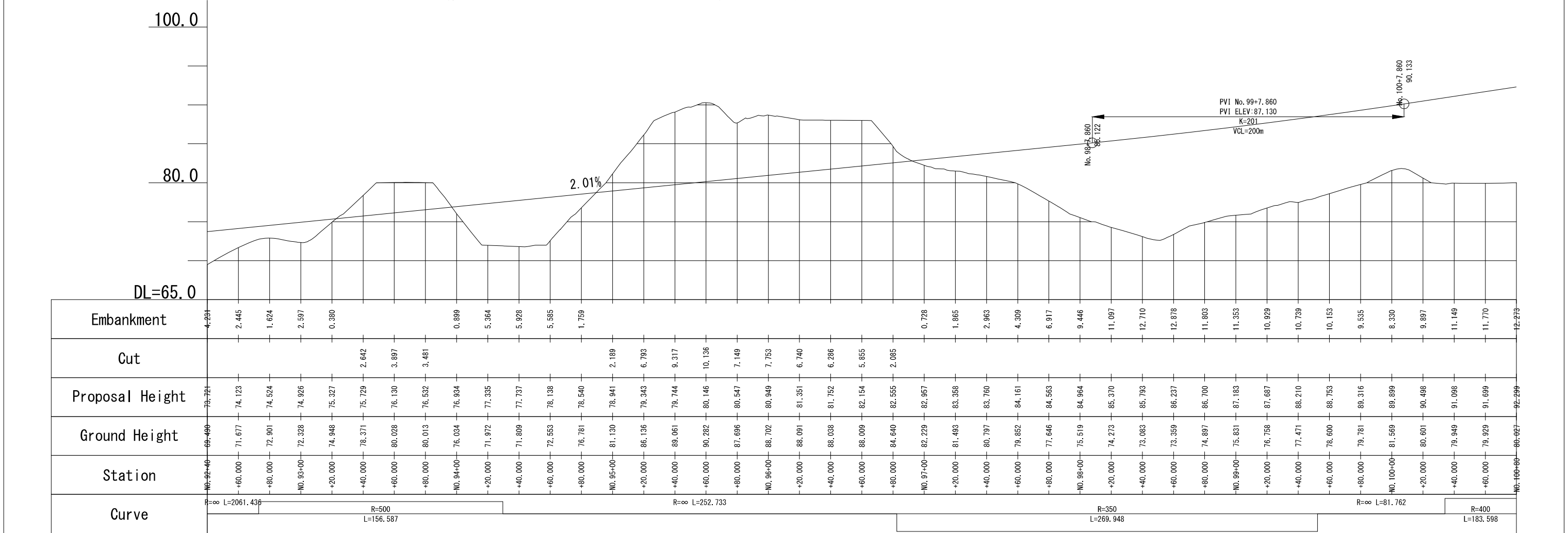
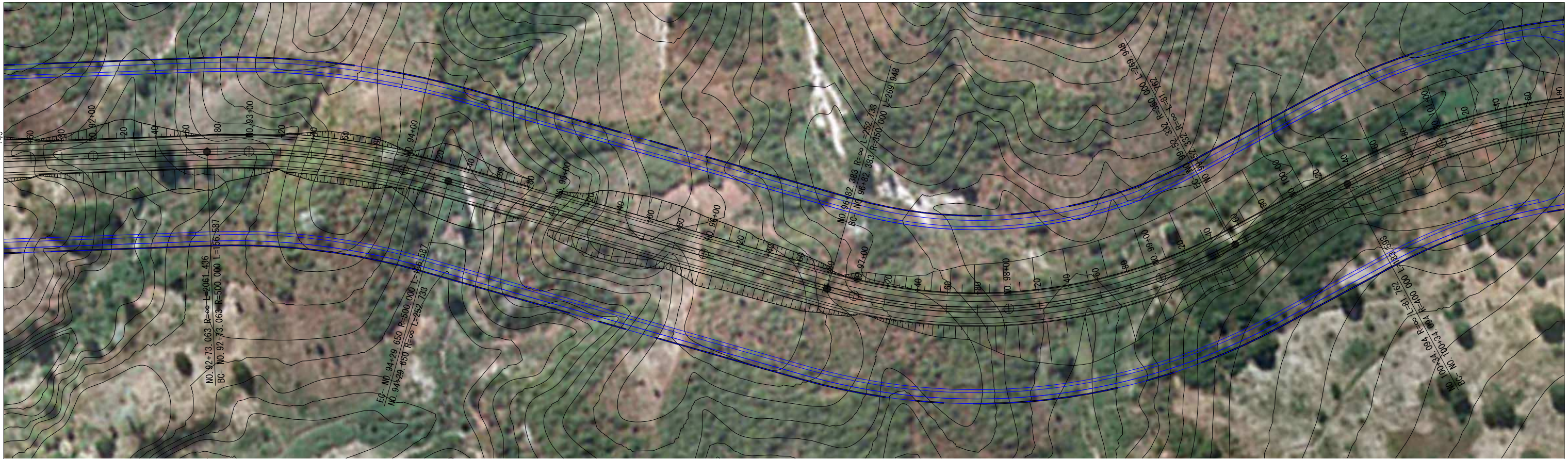
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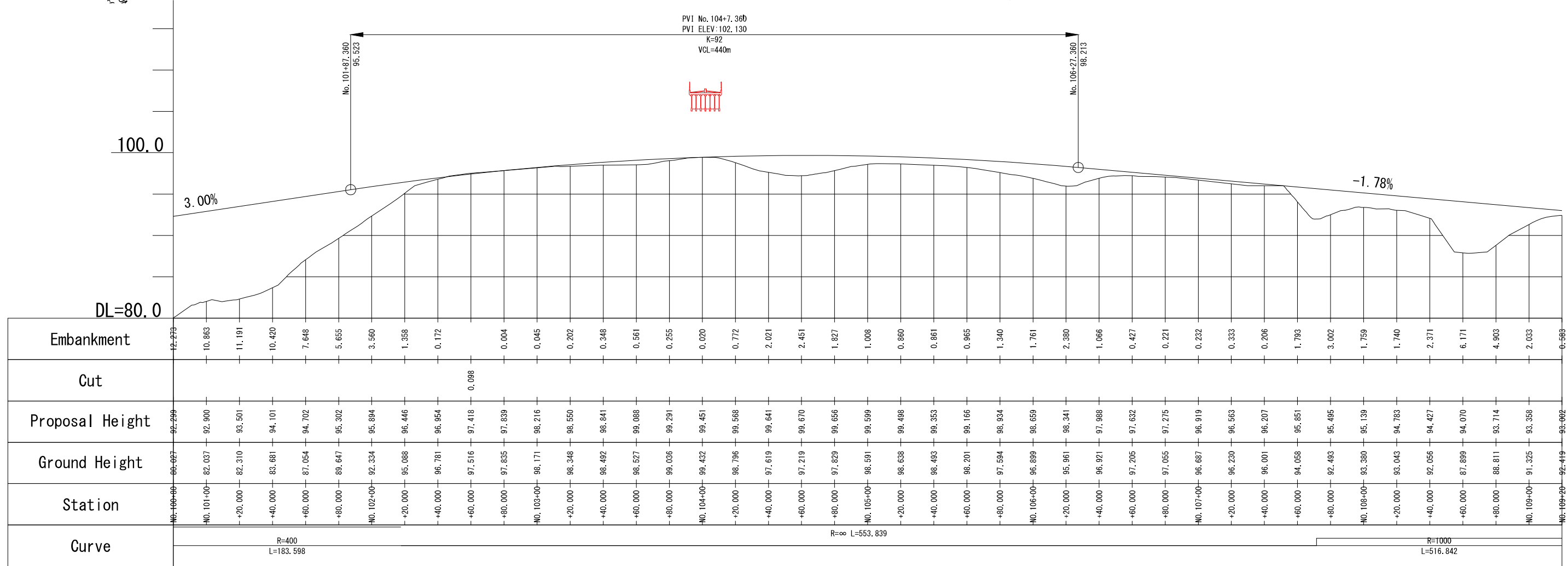
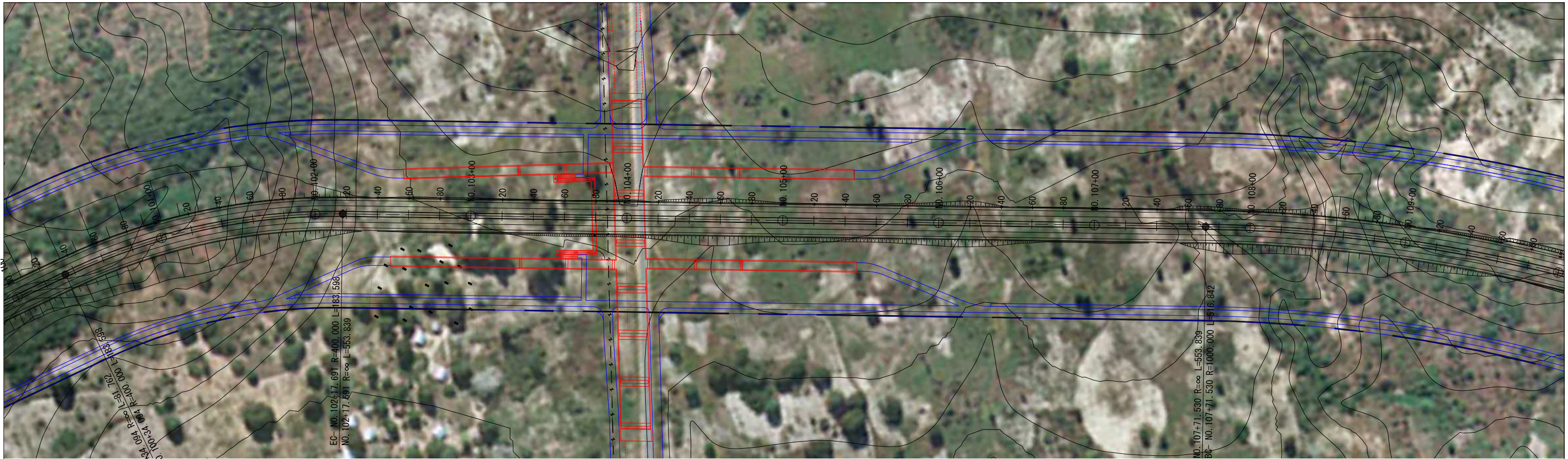
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-60.000	44.121	51.209		7.088
-80.000	45.461	51.947		6.487
NO. 85+00	46.393	52.729		6.336
-20.000	47.313	53.529		6.217
-40.000	48.474	54.329		5.856
-60.000	49.940	55.129		5.189
-80.000	51.374	55.929		4.556
NO. 86+00	52.783	56.729		3.946
-20.000	54.112	57.513		3.401
-40.000	55.476	58.269		2.792
-60.000	57.549	58.997		1.448
-80.000	59.761	59.697	0.064	
NO. 87+00	62.903	60.370	2.533	
-20.000	65.040	61.015	4.025	
-40.000	68.051	61.632	6.419	
-60.000	69.412	62.221	7.191	
-80.000	71.119	62.783	8.336	
NO. 88+00	72.948	63.317	9.631	
-20.000	74.879	63.840	11.039	
-40.000	76.474	64.363	12.111	
-60.000	77.591	64.885	12.705	
-80.000	78.000	65.408	12.592	
NO. 89+00	78.000	65.931	12.069	
-20.000	78.000	66.454	11.546	
-40.000	78.000	66.976	11.024	
-60.000	78.000	67.499	10.501	
-80.000	75.747	68.015	7.782	
NO. 90+00	74.012	68.519	5.483	
-20.000	72.070	69.011	3.059	
-40.000	67.416	69.491		2.075
-60.000	70.729	69.959	0.771	
-80.000	72.585	70.414	2.171	
NO. 91+00	74.567	70.857	3.710	
-20.000	76.012	71.289	4.723	
-40.000	73.204	71.708	1.496	
-60.000	72.017	72.115		0.098
-80.000	67.995	72.517		4.522
NO. 92+00	67.861	72.918		5.057
-20.000	67.784	73.320		5.536
NO. 92+40	69.490	73.721		4.291

R=∞ L=2061.436

	Japan International Cooperation Agency Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd.	PREPARED BY CHECKED BY APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile
	National Road Administration (ANE)	NAME SIGNATURE DATE	SCALE: 1/2500 SHEET NO.: DRAWING NO.: B-12 REV. NO.:	



	Japan International Cooperation Agency National Road Administration (ANE)	Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd.	PREPARED BY CHECKED BY APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile
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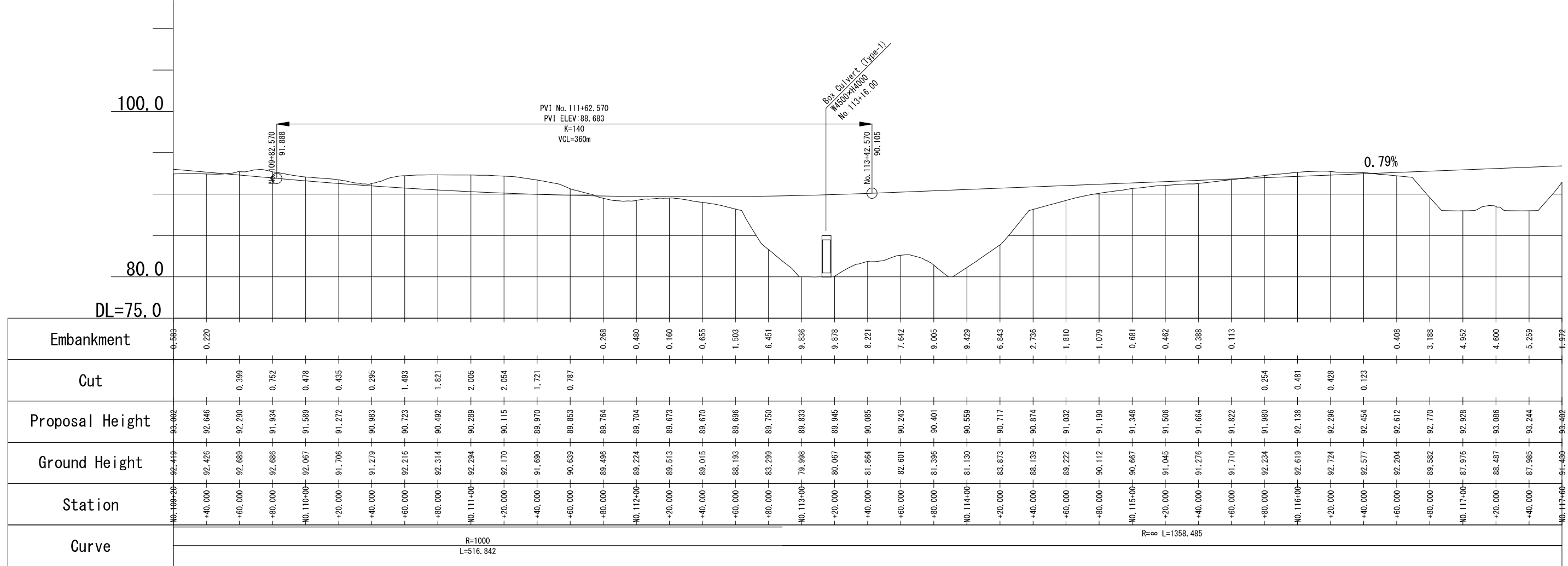
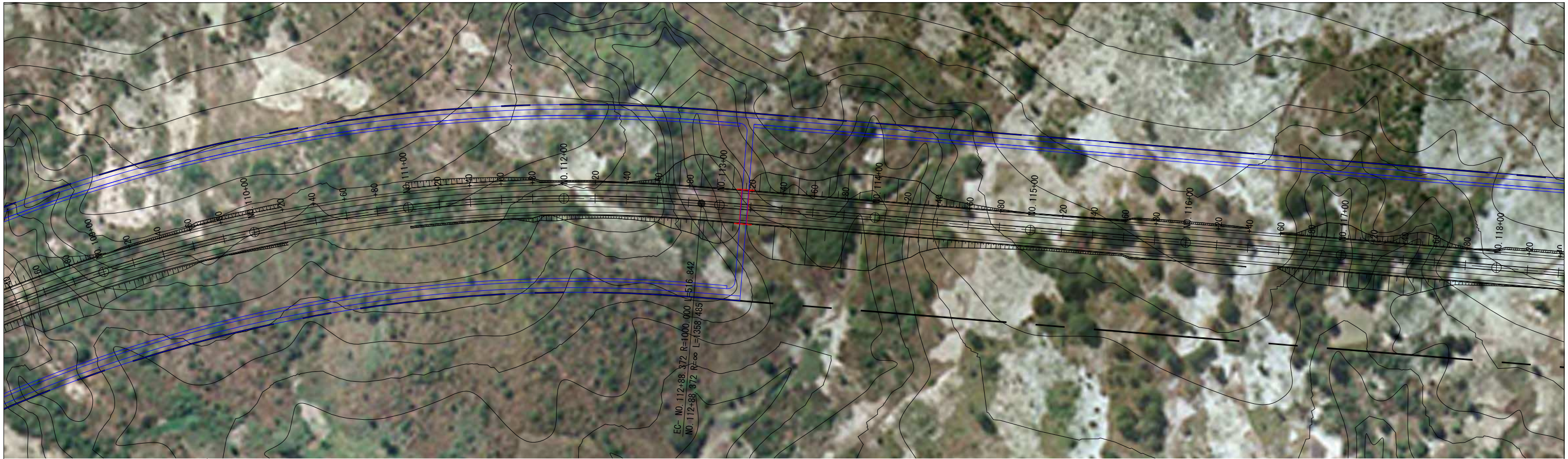
Japan International Cooperation Agency
 National Road Administration (ANE)

Oriental Consultants Global Co., Ltd.
 Eight-Japan Engineering Consultants Inc.
 Kokusai Kogyo Co., Ltd.

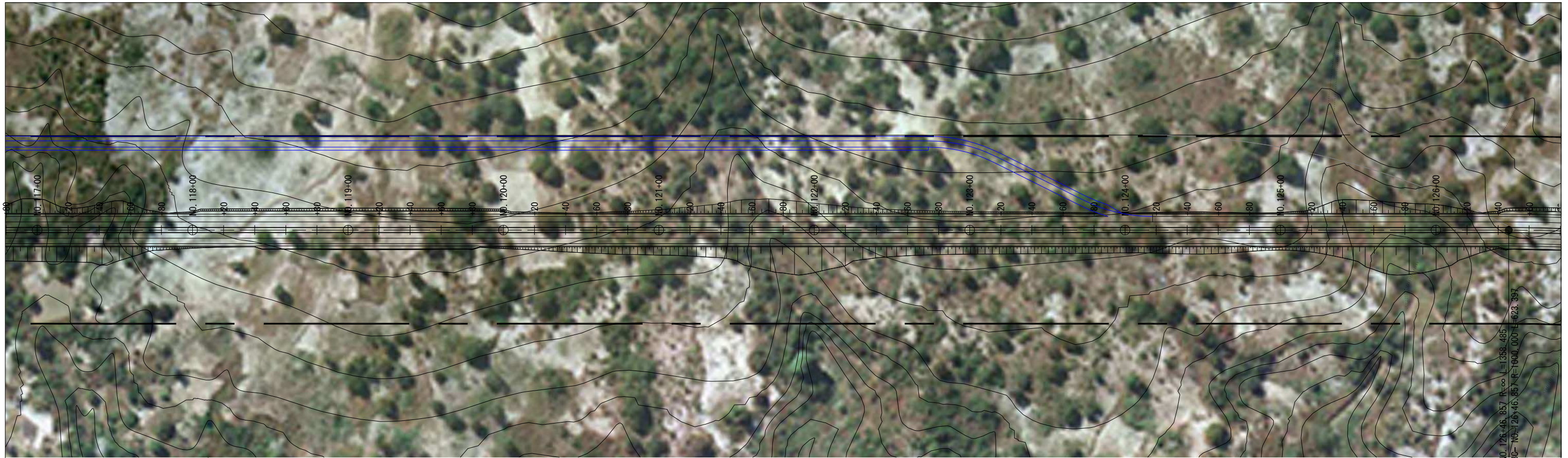
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NAME		
SIGNATURE		
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PROJECT TITLE:
**Preparatory Survey for Nacala Corridor
 Road Network Upgrading Project
 (Nacala Port Access Road)**

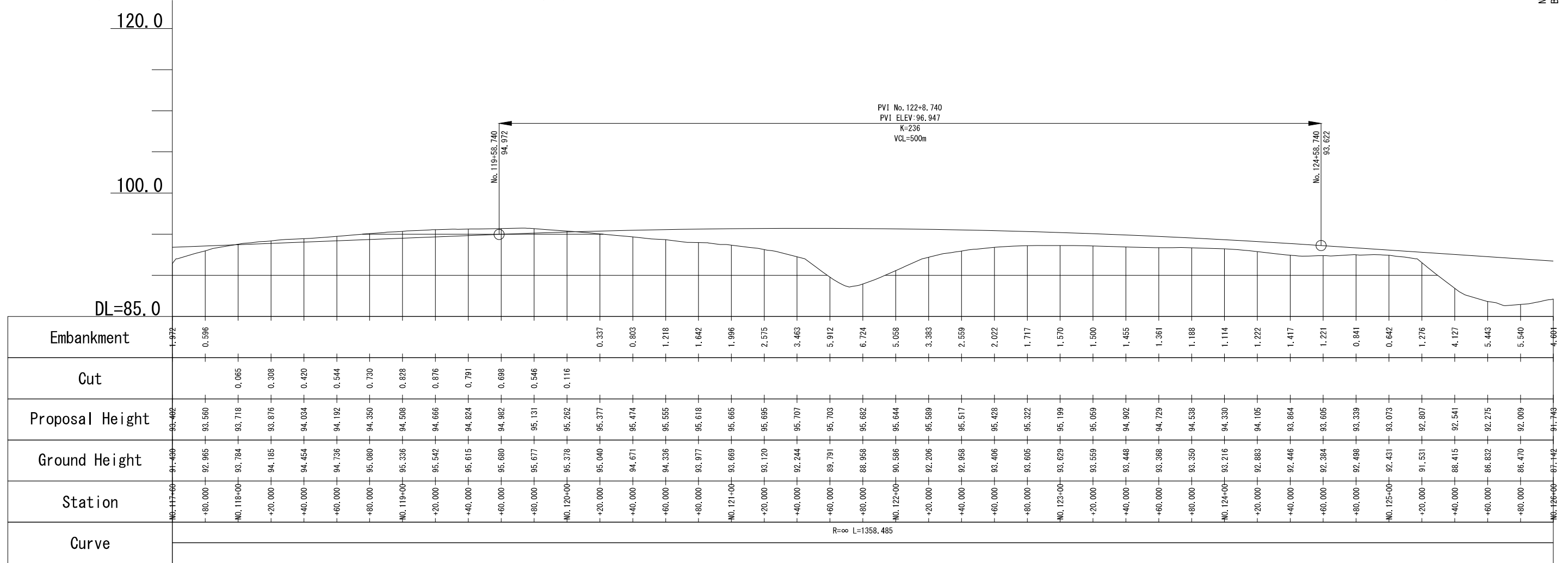
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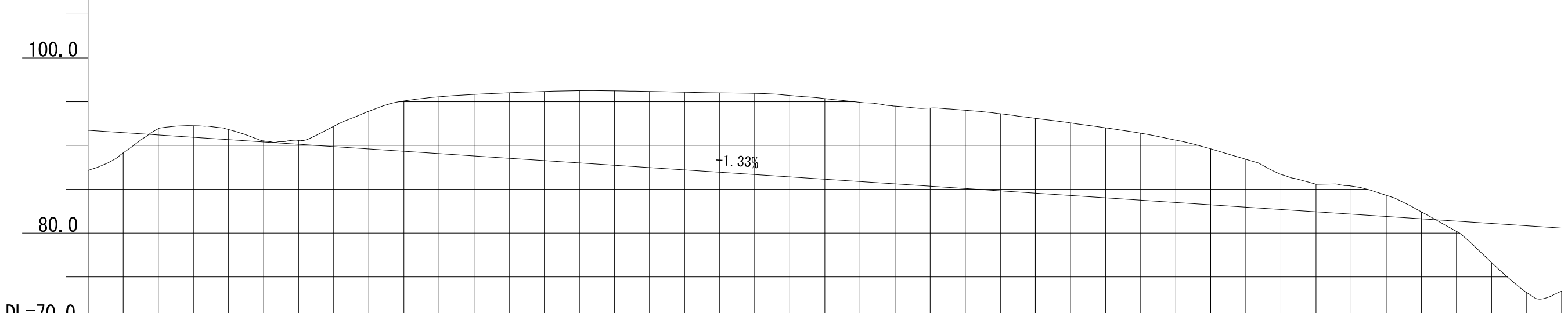
Japan International Cooperation Agency National Road Administration (ANE)	Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd.	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile			
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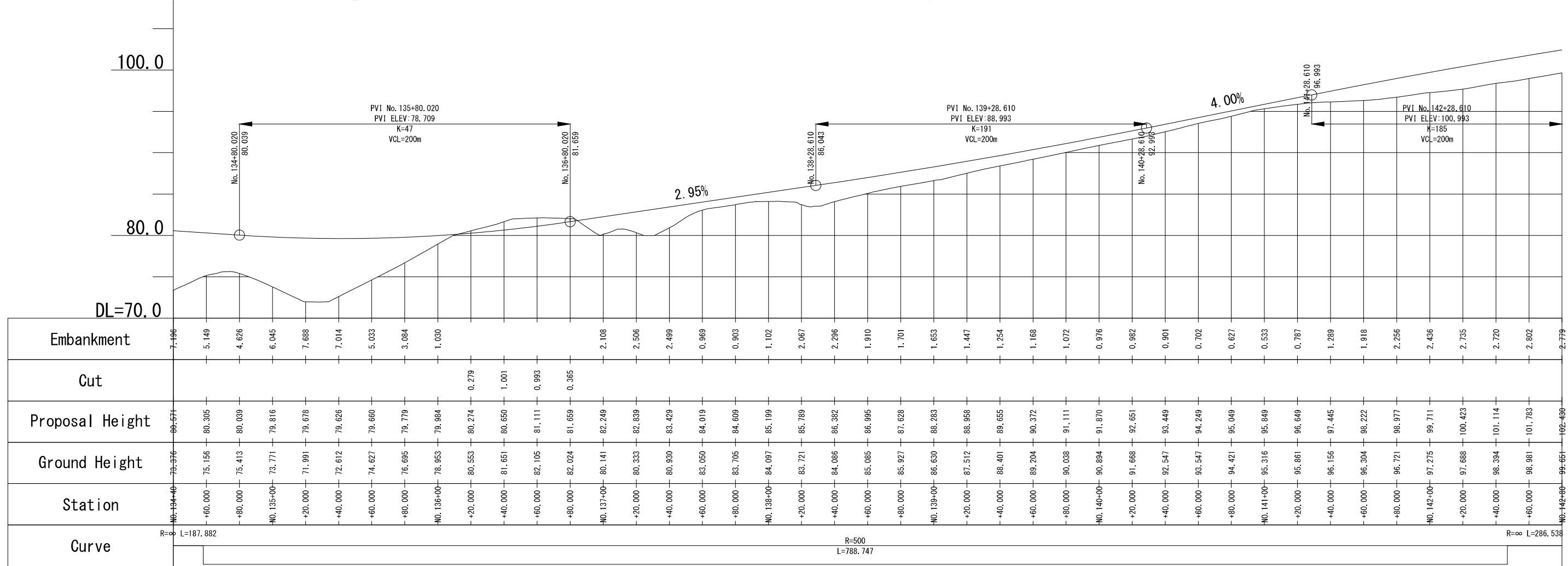
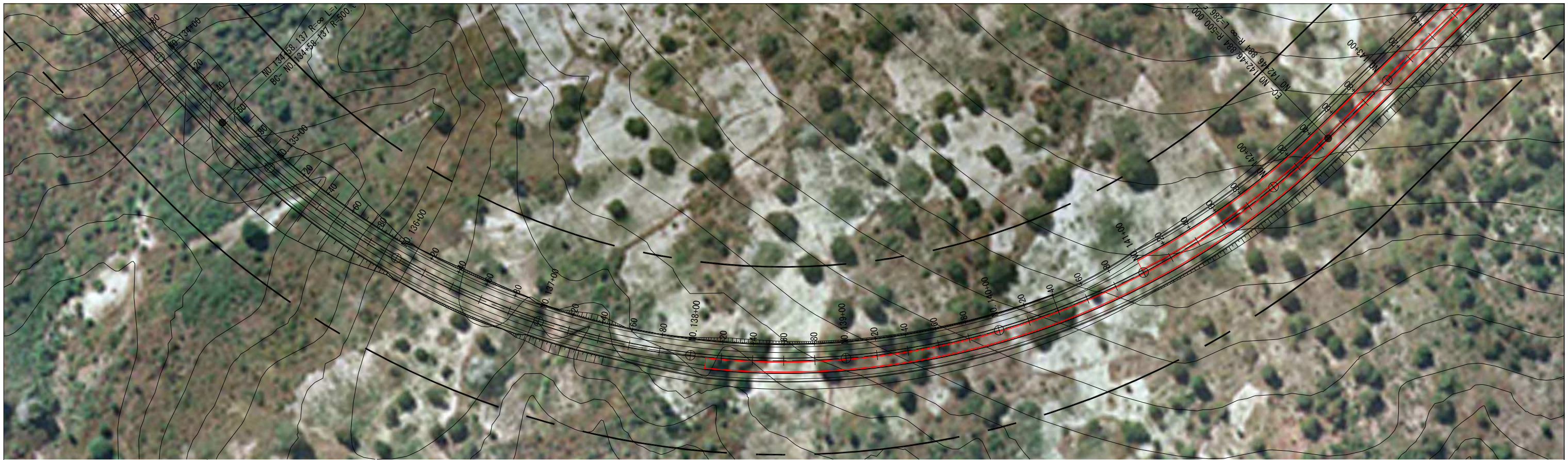


Japan International Cooperation Agency National Road Administration (ANE)	Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd.	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile			
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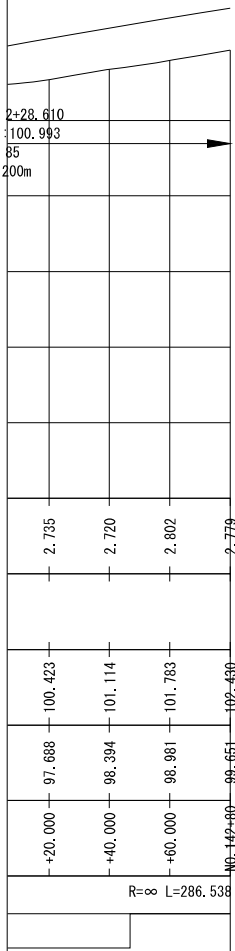


Station	Ground Height	Proposal Height	Cut	Embankment
NO. 126+00	87.142	91.743		4.601
+20,000	89.144	91.477		2.333
+40,000	91.921	91.211	0.709	
+60,000	92.260	90.945	1.315	
+80,000	91.835	90.679	1.156	
NO. 127+00	90.513	90.413	0.100	
+20,000	90.560	90.147	0.412	
+40,000	92.187	89.881	2.306	
+60,000	93.908	89.615	4.293	
+80,000	95.096	89.349	5.747	
NO. 128+00	95.564	89.083	6.480	
+20,000	95.638	88.817	7.021	
+40,000	96.025	88.551	7.473	
+60,000	96.162	88.285	7.877	
+80,000	96.261	88.019	8.242	
NO. 129+00	96.241	87.753	8.488	
+20,000	96.175	87.487	8.688	
+40,000	96.088	87.221	8.867	
+60,000	96.020	86.955	9.065	
+80,000	95.952	86.689	9.262	
NO. 130+00	95.722	86.423	9.299	
+20,000	95.361	86.157	9.204	
+40,000	94.932	85.891	9.041	
+60,000	94.500	85.625	8.874	
+80,000	94.282	85.359	8.923	
NO. 131+00	94.022	85.093	8.929	
+20,000	93.628	84.827	8.801	
+40,000	93.112	84.561	8.551	
+60,000	92.584	84.295	8.288	
+80,000	92.032	84.029	8.002	
NO. 132+00	91.404	83.763	7.641	
+20,000	90.603	83.497	7.106	
+40,000	89.611	83.231	6.380	
+60,000	88.425	82.965	5.460	
+80,000	86.700	82.699	4.001	
NO. 133+00	85.578	82.433	3.144	
+20,000	85.358	82.167	3.191	
+40,000	84.304	81.901	2.403	
+60,000	82.421	81.635	0.786	
+80,000	80.197	81.369		1.173
NO. 134+00	76.631	81.103		4.473
+20,000	73.202	80.837		7.635
NO. 134+40	73.976	80.571		7.196

		PREPARED BY CHECKED BY APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile			
		NAME SIGNATURE DATE		SCALE 1/2500	SHEET NO.	DRAWING NO. B-17	REV. NO.



Japan International Cooperation Agency National Road Administration (ANE)	Oriental Consultants Global Co., Ltd. Eight-Japan Engineering Consultants Inc. Kokusai Kogyo Co., Ltd.	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (Nacala Port Access Road)	DRAWING TITLE: Completion Stage Plan and Profile			
		NAME				SCALE	SHEET NO.	DRAWING NO.	REV. NO.
		SIGNATURE				1/2500		B-18	
		DATE							



Station	Ground Height	Proposal Height	Cut	Embankment
NO. 142+00	100.506	103.056		2.551
+20,000	101.557	103.660		2.103
+40,000	102.609	104.247		1.637
+60,000	103.662	104.831		1.168
+80,000	104.300	105.415		1.115
NO. 144+00	104.741	105.999		1.258
+20,000	105.305	106.583		1.278
+40,000	105.823	107.167		1.344
+60,000	105.877	107.752		1.874
+80,000	105.743	108.336		2.593
NO. 145+00	106.403	108.920		2.517
+20,000	108.305	109.504		1.199
NO. 146+00	109.696			

Japan International Cooperation Agency
 National Road Administration (ANE)

Oriental Consultants Global Co., Ltd.
 Eight-Japan Engineering Consultants Inc.
 Kokusai Kogyo Co., Ltd.

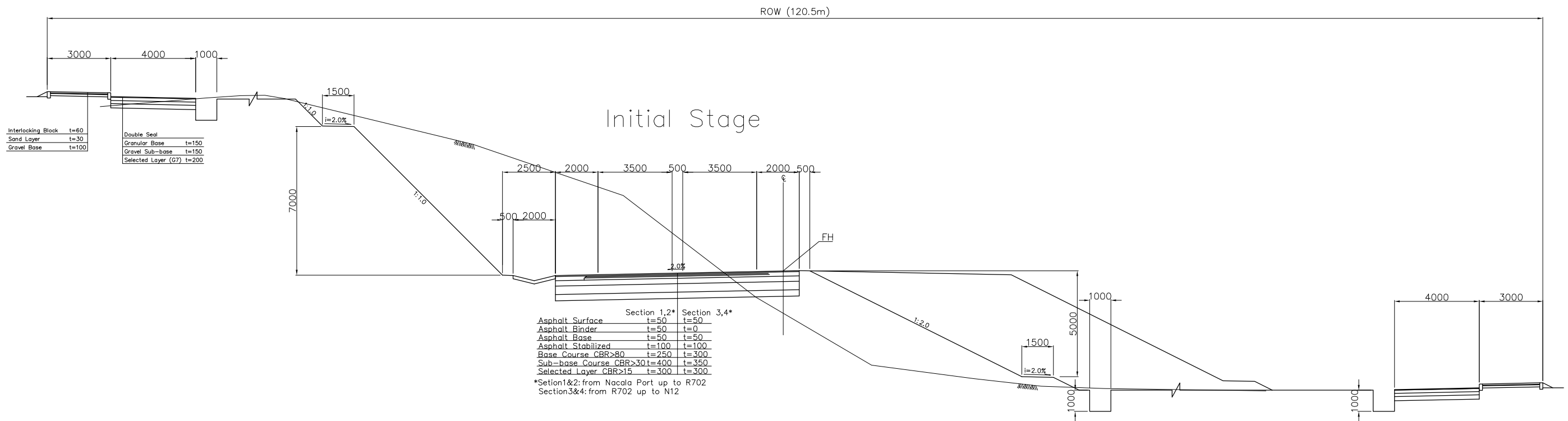
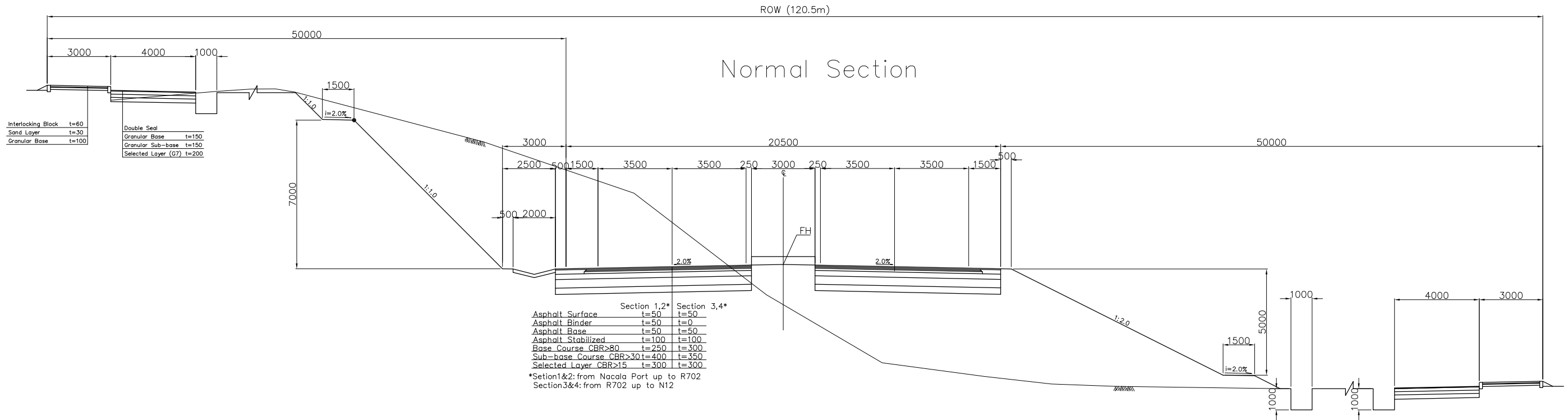
PREPARED BY	CHECKED BY	APPROVED BY
NAME		
SIGNATURE		
DATE		

PROJECT TITLE:
**Preparatory Survey for Nacala Corridor
 Road Network Upgrading Project
 (Nacala Port Access Road)**

DRAWING TITLE:		Completion Stage Plan and Profile	
SCALE	SHEET NO.	DRAWING NO.	REV. NO.
1/2500		B-19	

NACALA PORT ACCESS ROAD

Typical Cross Section

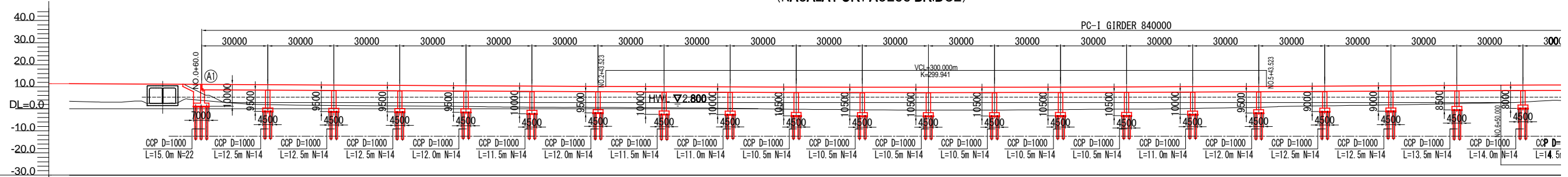


	Japan International Cooperation Agency	Oriental Consultants Global Co., Ltd.	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (NACALA PORT ACCESS ROAD)	DRAWING TITLE: Completion Stage Typical Cross Section			
	National Road Administration (ANE)	Eight-Japan Engineering Consultants Inc.	Kokusai Kogyo Co., Ltd.	NAME				SCALE	SHEET NO.	DRAWING NO.
			DATE				1/200		B-20	

SIDE VIEW S=1/2000

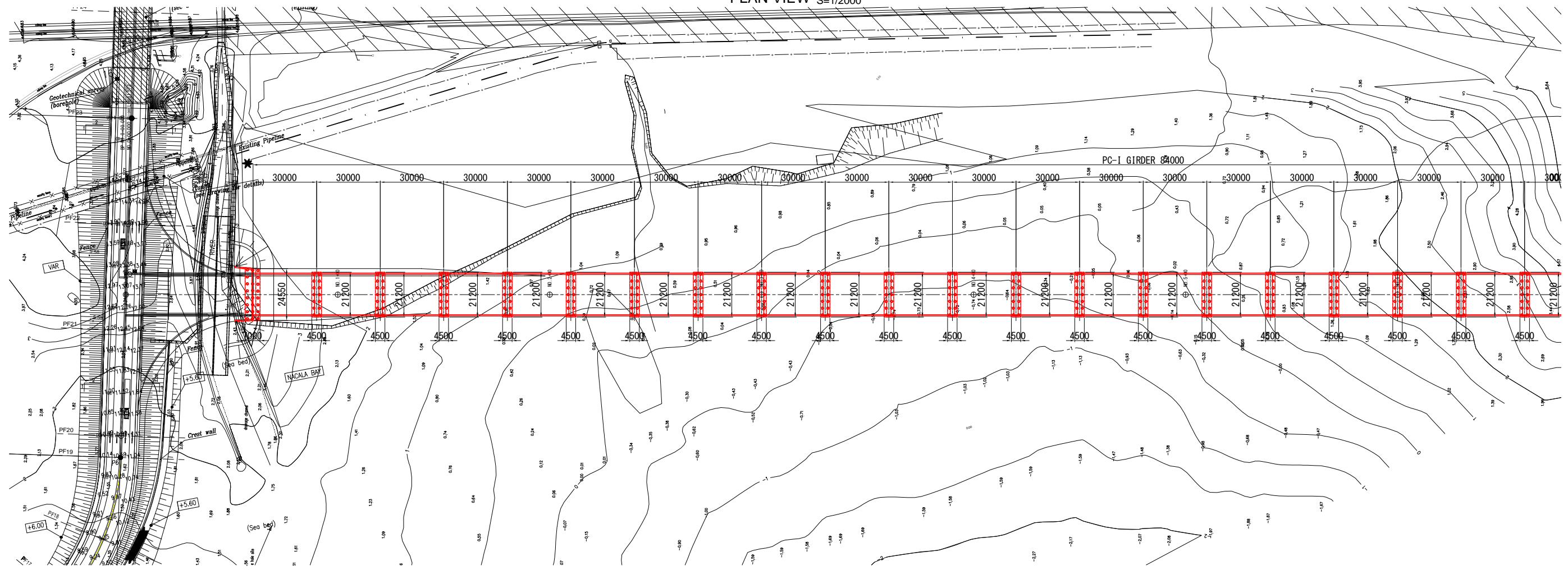
GENERAL VIEW 1-2
(NACALA PORT ACCESS BRIDGE)

PC-I GIRDER 840000



GRADIENT	11.400		$i = -0.500\%$ $L = 393.523m$												9.432		$i = 0.500\%$ $L = 406.477m$																			
PROPOSED HEIGHT	11.400	11.300	11.200	11.100	11.000	10.900	10.800	10.700	10.600	10.500	10.400	10.300	10.200	10.104	10.022	9.953	9.897	9.855	9.826	9.810	9.808	9.819	9.843	9.881	9.932	9.996	10.074	10.165	10.265	10.365	10.465	10.565	10.665	10.762		
GROUND HEIGHT	3.374	2.984	2.513	3.778	2.203	1.693	1.494	1.338	1.234	1.046	0.800	0.668	0.637	0.484	0.397	0.198	-0.100	-0.297	-0.501	-0.532	-0.567	-0.575	-0.472	-0.283	-0.166	-0.018	0.328	0.674	1.210	1.518	1.761	2.147	2.497	3.027		
DISTANCE	0.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000		
STATION	NO. 0 +0.000	+20.000	+40.000	+60.000	+80.000	NO. 1 +20.000	+40.000	+60.000	+80.000	NO. 2 +20.000	+40.000	+60.000	+80.000	NO. 3 +20.000	+40.000	+60.000	+80.000	+20.000	+40.000	+60.000	+80.000	NO. 4 +20.000	+40.000	+60.000	+80.000	NO. 5 +20.000	+40.000	+60.000	+80.000	NO. 6 +20.000	+40.000	+60.000	+80.000	...		
CURVE ELEMENT	$R = \infty$ $L = 681.572$																																			

PLAN VIEW S=1/2000



Japan International Cooperation Agency
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Oriental Consultants Global Co., Ltd.
 Eight-Japan Engineering Consultants Inc.
 Kokusai Kogyo Co., Ltd.

PREPARED BY	CHECKED BY	APPROVED BY
NAME		
SIGNATURE		
DATE		

PROJECT TITLE:
**Preparatory Survey for Nacala Corridor
Road Network Upgrading Project
(Nacala Port Access Road)**

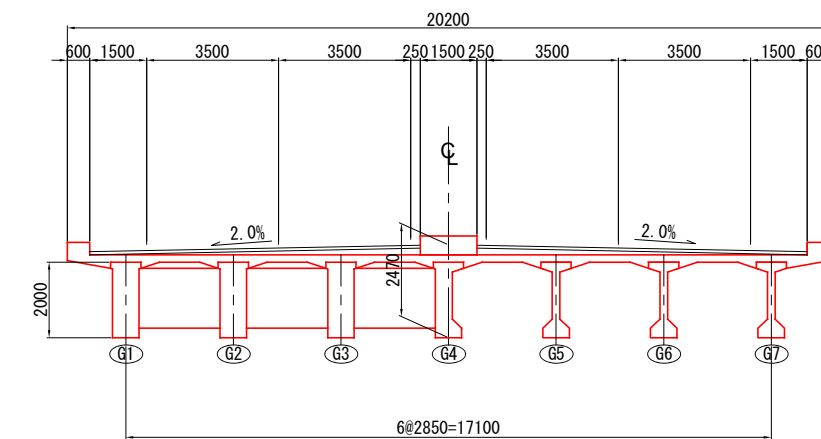
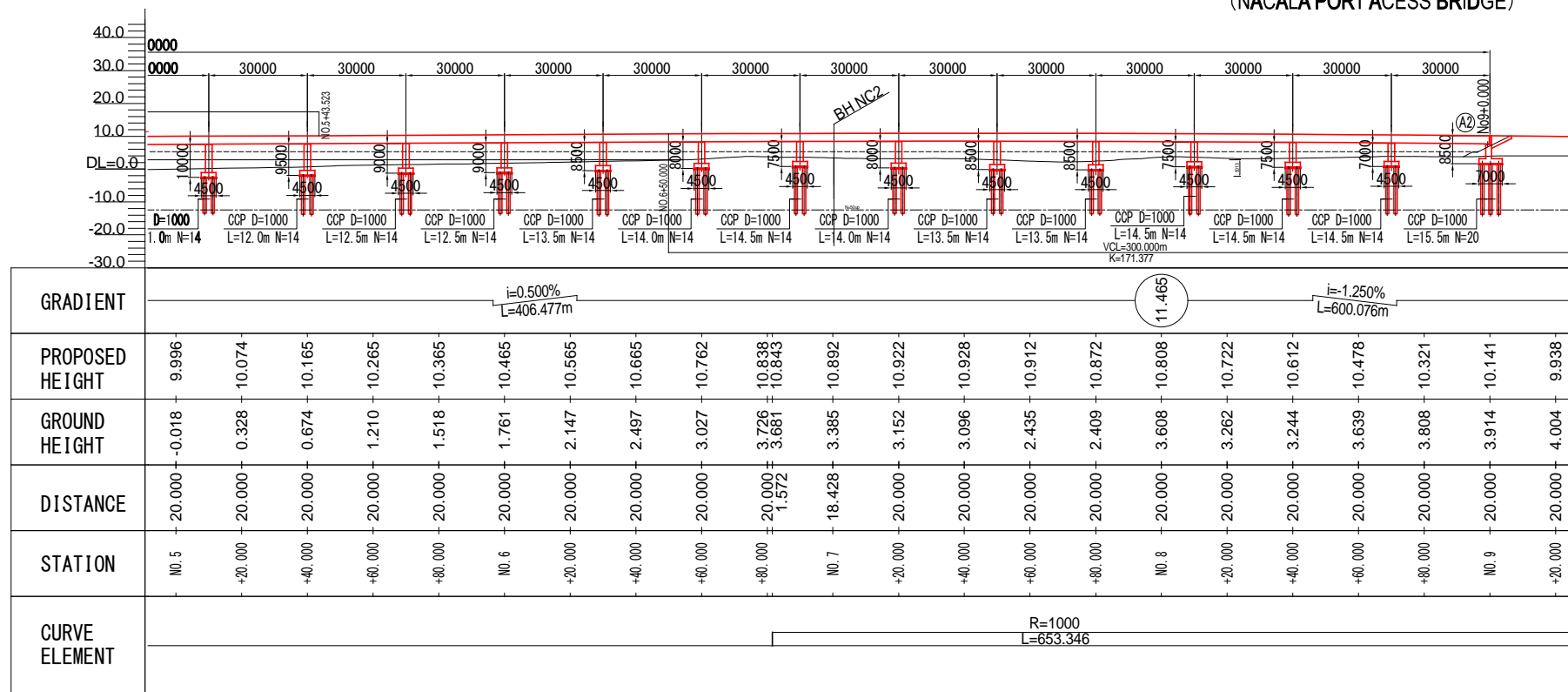
DRAWING TITLE: **Completion Stage
GENERAL VIEW - 1/2 (NACALA PORT ACCESS BRIDGE)**

SCALE	SHEET NO.	DRAWING NO.	REV. NO.
		B-21	

SIDE VIEW S=1/2000

GENERAL VIEW 1-2
(NACALA PORT ACCESS BRIDGE)

SUPERSTRUCTURE CROSS SECTION S=1/200



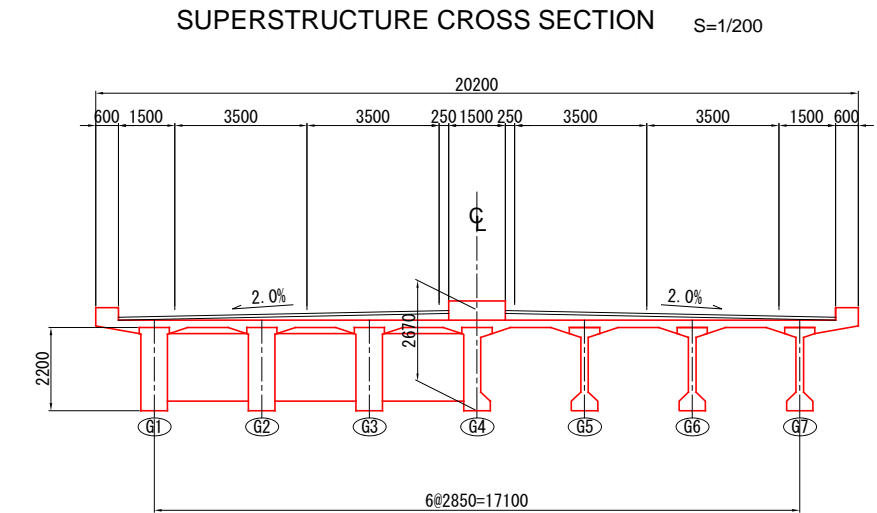
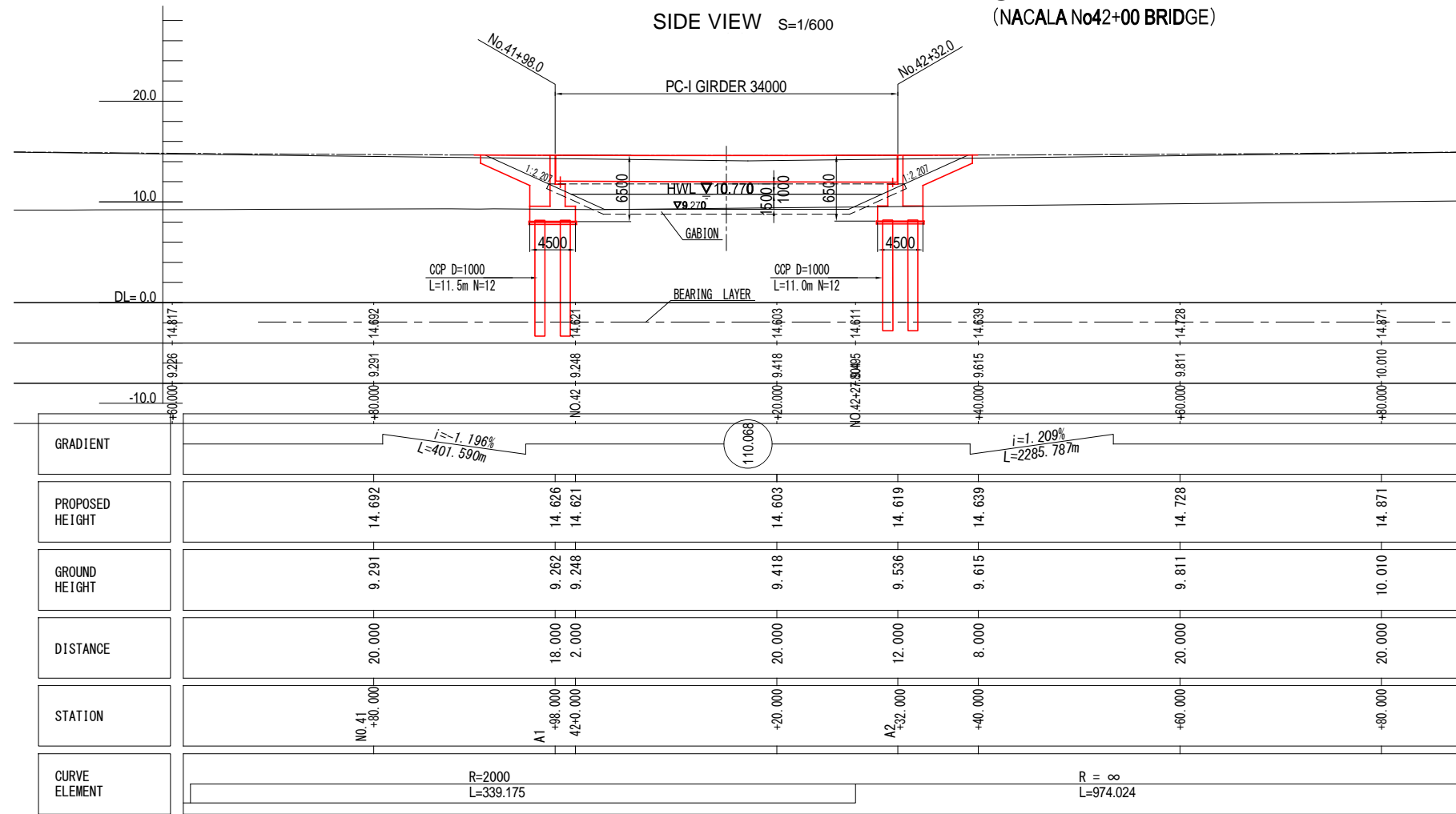
PLAN VIEW S=1/2000



DESIGN CONDITION

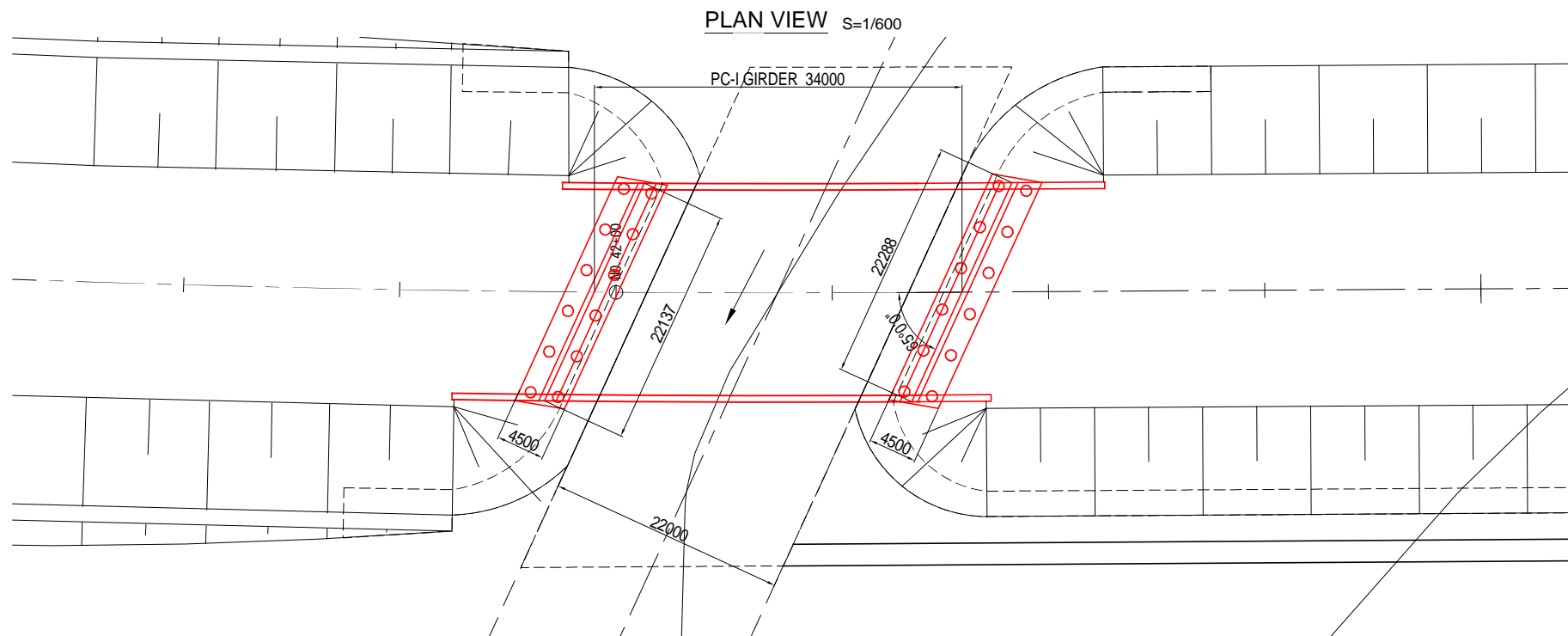
TOTAL BRIDGE LENGTH	4@30.0+4x5@30.0+4@30.0=840.000m
GIRDER LENGTH	4@29.8m+4x5@+29.8m+4@29.8m
SPAN	4@29.0m+4x5@+29.0m+4@29.0m
WIDTH	20.200m
ANGLE OF SKEW	90°00'00"
RADIUS OF CURVATURE	R=∞~1000
LONGITUDINAL SLOPE	-0.500% 0.500% -1.250%
COMPRESSIVE STRENGTH	Main Girder:σck=40N/mm2 Floor Slab:σck=30N/mm2

GENERAL VIEW (NACALA No42+00 BRIDGE)



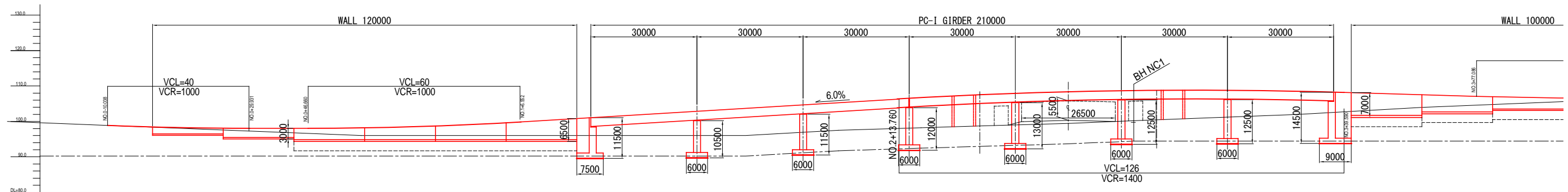
DESIGN CONDITION

TOTAL BRIDGE LENGTH	34.000m
GIRDER LENGTH	33.800m
SPAN	33.000m
WIDTH	20.200m
ANGLE OF SKEW	65°00'00"
RADIUS OF CURVATURE	R=2000 - ∞
LONGITUDINAL SLOPE	4.000% -4.000%
COMPRESSIVE STRENGTH	Main Girder: $\sigma_{ck}=40\text{N/mm}^2$ Floor Slab: $\sigma_{ck}=30\text{N/mm}^2$



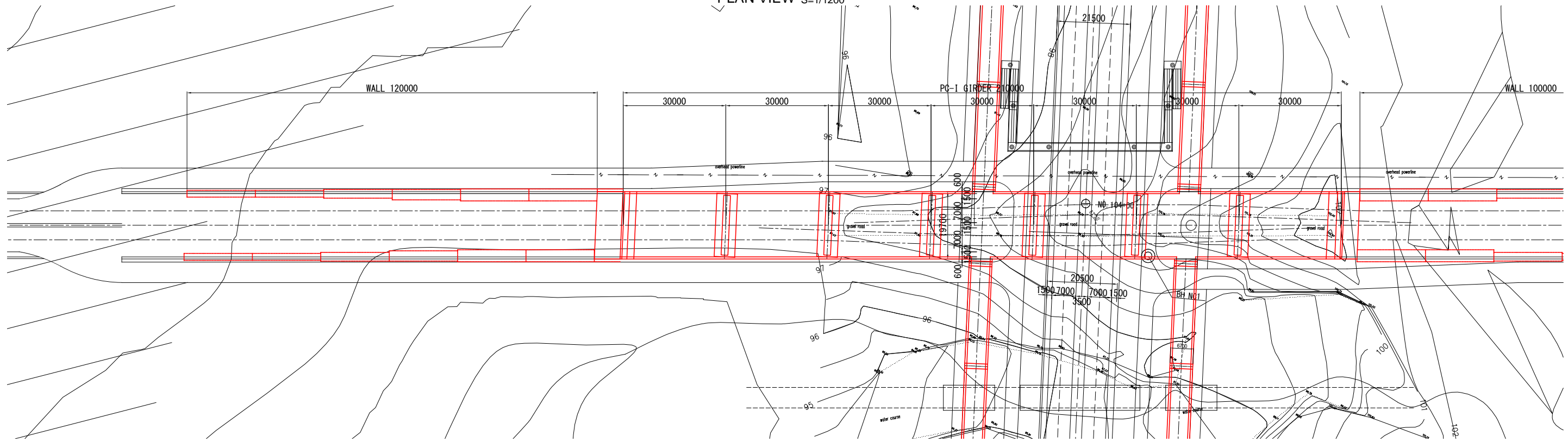
GENERAL VIEW 1-2 (NACARA702 OVER BRIDGE)

SIDE VIEW S=1/1200



GRADIENT	$i = -4.000\%$ $L = 100.000m$																																			
PROPOSED HEIGHT	99.265	98.867	98.516	98.268	98.117	98.068	98.068	98.068	98.157	98.517	98.468	99.470	99.863	100.670	101.068	101.865	102.868	103.070	104.270	104.668	105.470	106.465	106.656	107.623	107.880	108.303	108.651	108.698	108.807	108.780	108.630	108.265	108.167	107.567	106.971	106.629
GROUND HEIGHT	99.265	98.867	98.465	98.068	97.665	97.268	96.865	96.599	96.065	96.000	96.000	96.000	96.000	96.000	96.000	96.000	96.550	96.929	97.604	98.115	98.219	98.834	99.026	99.412	100.089	100.206	100.976	101.231	101.745	102.589	102.761	103.900	104.727	105.574		
DISTANCE	0.000	9.962	10.038	9.939	10.061	9.931	10.069	6.660	13.340	16.633	3.367	20.000	6.552	13.448	6.633	13.367	16.633	3.367	20.000	6.633	13.367	16.633	3.367	20.000	6.633	13.367	16.633	3.367	20.000	6.633	13.367	16.633	3.367	20.000	20.000	
STATION	NO.0 -20.000	-10.038	NO.0 +00.000	+9.939	+20.000	+29.931	+40.000	+46.660	+60.000	+76.633	+80.000	NO.1 +00.000	+6.552	+20.000	A1 +26.633	+40.000	P1 +56.633	+60.000	+80.000	P2 +86.633	NO.2 +00.000	P3 +16.633	+20.000	+40.000	P4 +46.633	+60.000	P5 +76.633	+80.000	NO.3 +00.000	P6 +6.633	+20.000	A2 +36.633	+40.000	+60.000	+80.000	NO.4 +00.000
CURVE ELEMENT	$R = \infty$ $CL = 446.972$																																			

PLAN VIEW S=1/1200



Japan International Cooperation Agency
 National Road Administration (ANE)

Oriental Consultants Global Co., Ltd.
 Eight-Japan Engineering Consultants Inc.
 Kokusai Kogyo Co., Ltd.

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NAME		
SIGNATURE		
DATE		

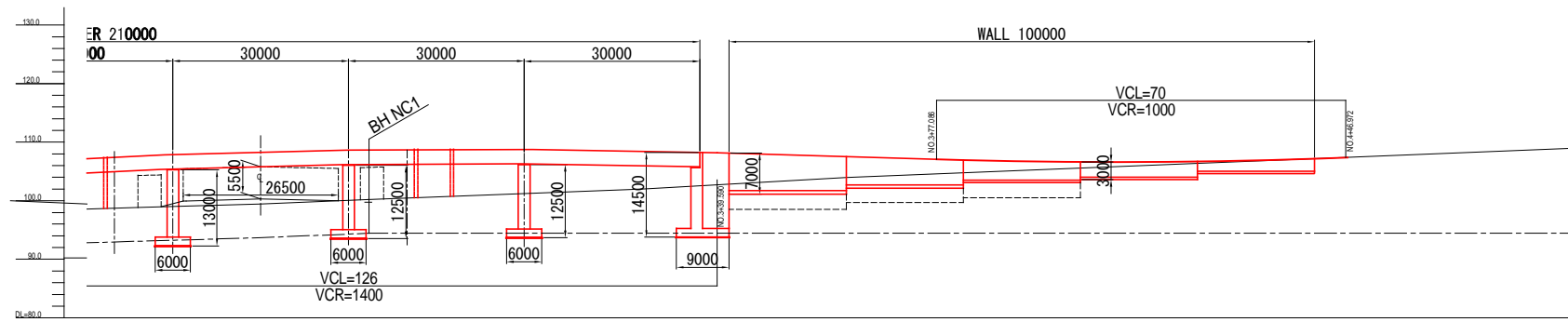
PROJECT TITLE:
**Preparatory Survey for Nacala Corridor
 Road Network Upgrading Project
 (Nacala Port Access Road)**

DRAWING TITLE: **Completion Stage**
GENERAL VIEW - 1/2 (NACARA 702 OVER BRIDGE)

SCALE	SHEET NO.	DRAWING NO.	REV. NO.
		B-24	

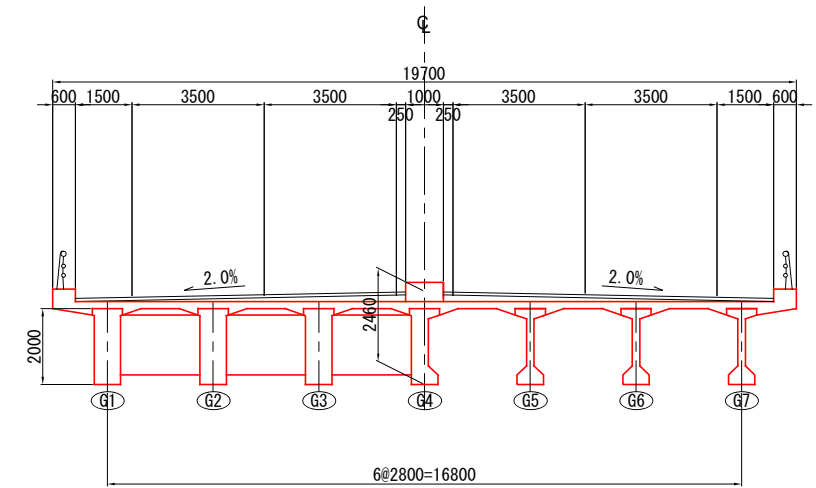
GENERAL VIEW 2-2 (NACARA R702 OVER BRIDGE)

SIDE VIEW S=1/1200



GRADIENT																	
PROPOSED HEIGHT	107.623	107.880	108.303	108.651	108.698	108.807	108.780	108.630	108.265	108.167	107.567	106.971	106.629	106.688	107.147	107.921	108.720
GROUND HEIGHT	98.834	99.026	99.412	100.069	100.206	100.976	101.231	101.745	102.569	102.761	103.900	104.727	105.574	106.324	107.122	107.921	108.720
DISTANCE	20.000	6.633	13.367	16.633	3.367	20.000	6.633	13.367	16.633	3.367	20.000	20.000	20.000	20.000	20.000	20.000	20.000
STATION	+40.000	+46.633	+60.000	+76.633	+80.000	+100.000	+106.633	+120.000	+136.633	+140.000	+160.000	+180.000	+200.000	+220.000	+240.000	+260.000	+280.000
CURVE ELEMENT	R=∞ CL=446.972																

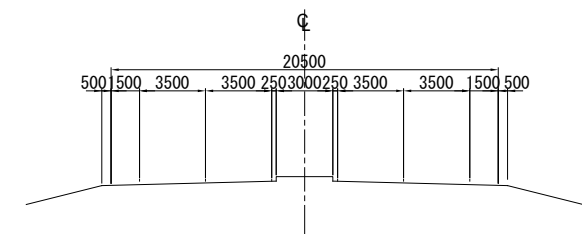
R702 CROSS SECTION S=1/200



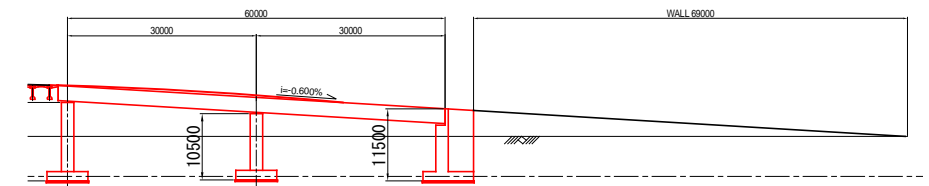
DESIGN CONDITION

TOTAL BRIDGE LENGTH	210.000m
GIRDER LENGTH	29.850m+5@29.800m+29.850m
SPAN	29.050m+5@29.000m+29.050m
WIDTH	19.700m
ANGLE OF SKEW	90°00'00"
RADIUS OF CURVATURE	R=∞
LONGITUDINAL SLOPE	6.000% -3.000%
COMPRESSIVE STRENGTH	Main Girder: σ _{ck} =40N/mm ²
	Floor Slab: σ _{ck} =30N/mm ²

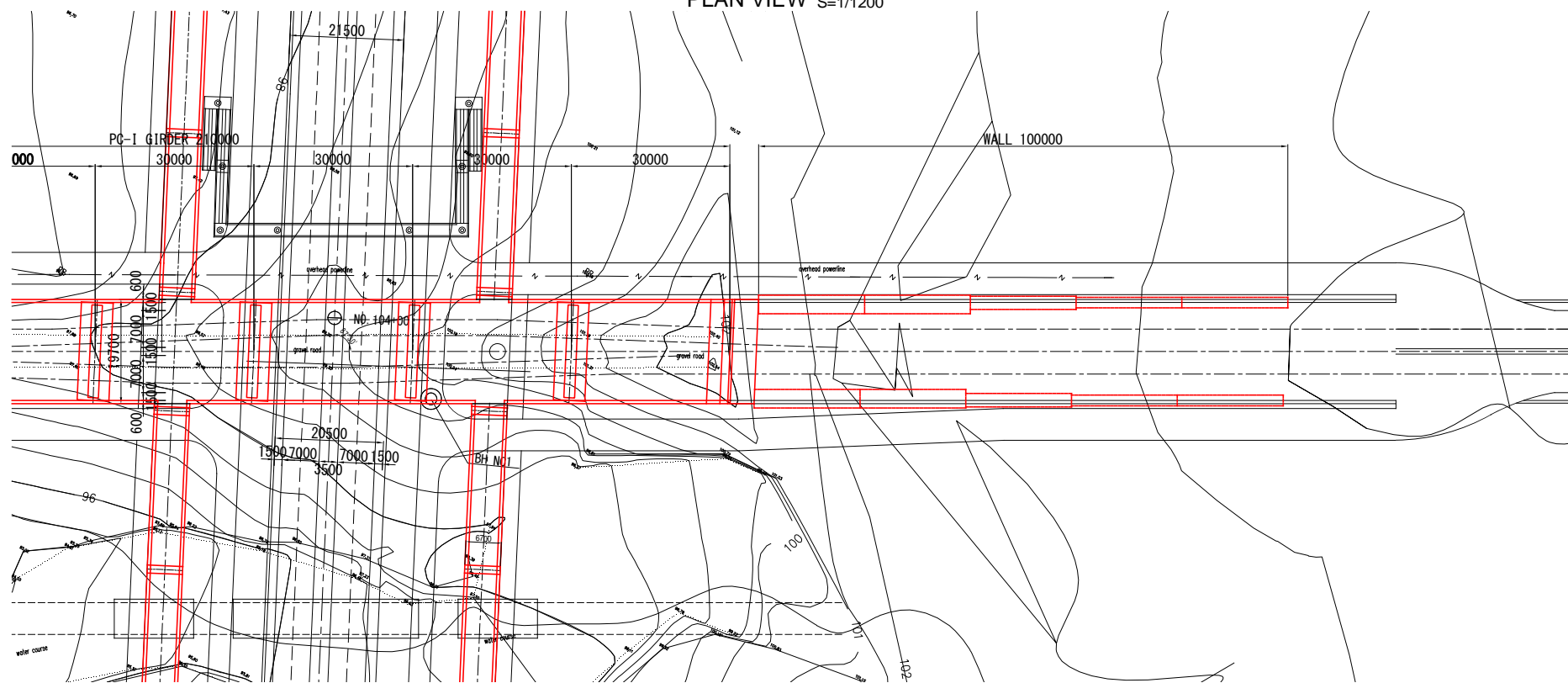
PORT ACCESS CROSS SECTION S=1/400



RAMP SIDE VIEW S=1/1200



PLAN VIEW S=1/1200



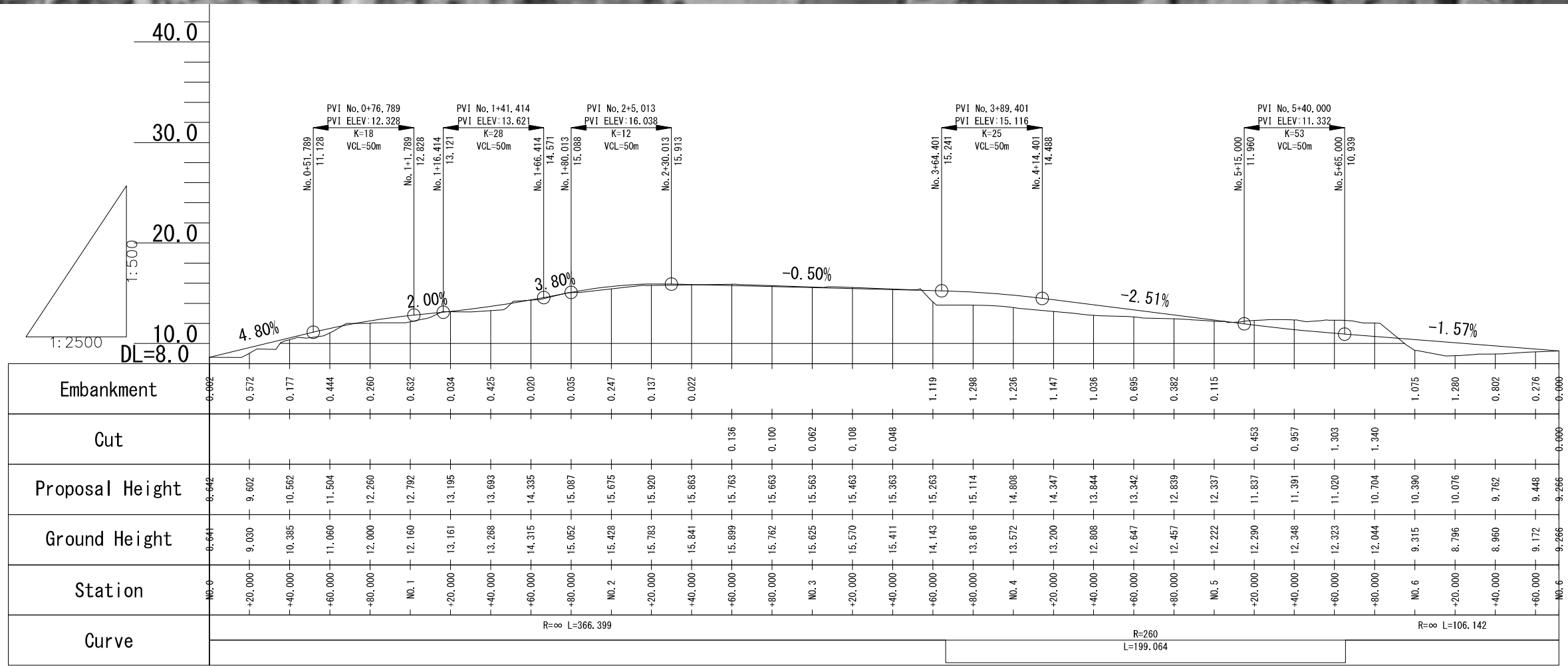
Japan International Cooperation Agency
 National Road Administration (ANE)

Oriental Consultants Global Co., Ltd.
 Eight-Japan Engineering Consultants Inc.
 Kokusai Kogyo Co., Ltd.

PREPARED BY	CHECKED BY	APPROVED BY
NAME		
SIGNATURE		
DATE		

PROJECT TITLE:
**Preparatory Survey for Nacala Corridor
Road Network Upgrading Project
(Nacala Port Access Road)**

DRAWING TITLE: Completion Stage			
GENERAL VIEW - 2/2 (NACARA R702 OVER BRIDGE)			
SCALE	SHEET NO.	DRAWING NO.	REV. NO.
		B-25	



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 ANE National Road Administration (ANE)

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 Kokusai Kogyo Co., Ltd.

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NAME		
SIGNATURE		
DATE		

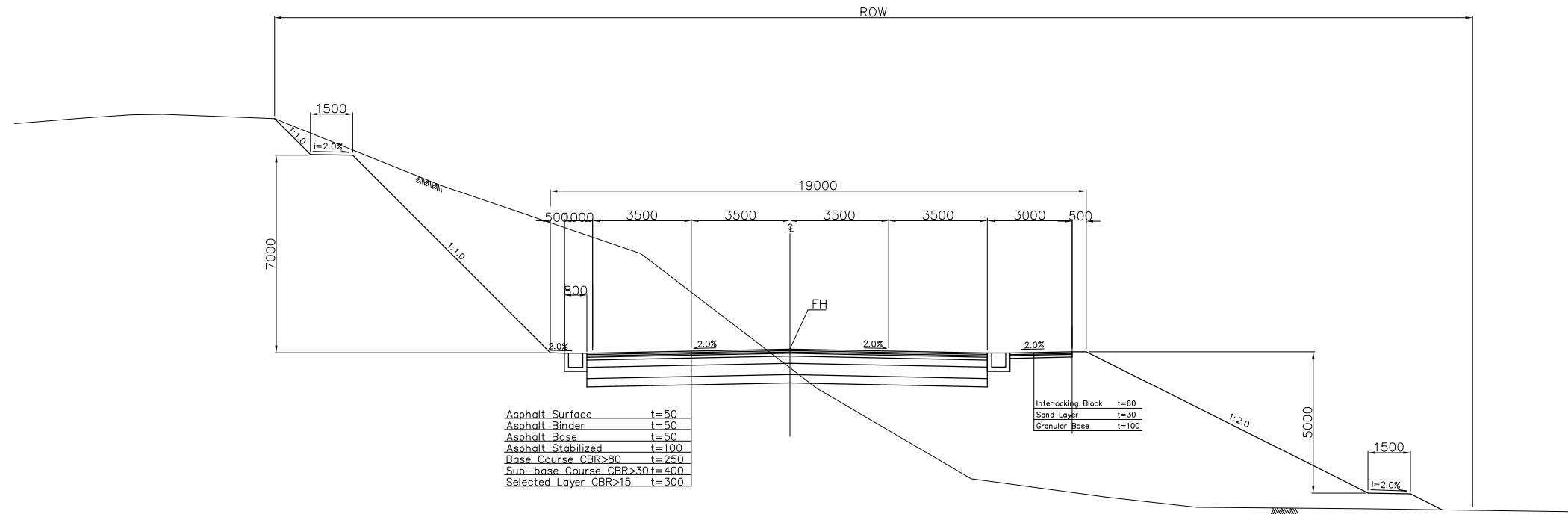
PROJECT TITLE:
**Preparatory Survey for Nacala Corridor
 Road Network Upgrading Project
 (Nampula Southern Bypass Road)**

DRAWING TITLE: **Completion Stage
 Starting point side harbor road-1/2**

SCALE	SHEET NO.	DRAWING NO.	REV. NO.
1/2500		B-26	

NACALA PORT ACCESS ROAD

Typical Cross Section



Japan International Cooperation Agency	Oriental Consultants Global Co., Ltd.	PREPARED BY	CHECKED BY	APPROVED BY	PROJECT TITLE: Preparatory Survey for Nacala Corridor Road Network Upgrading Project (NACALA PORT ACCESS ROAD)	DRAWING TITLE: Compreion Stage			
	Eight-Japan Engineering Consultants Inc.	NAME					Starting point side harbor road-2/2		
National Road Administration (ANE)	Kokusai Kogyo Co., Ltd.	SIGNATURE				SCALE	SHEET NO.	DRAWING NO.	REV. NO.
		DATE				1/200		B-27	