

DEPARTAMENTO DE ENGENHARIA DE PRODUÇÃO E TRANSPORTES
LABORATÓRIO DE SISTEMAS DE TRANSPORTE

PROJETO PONTO DE PARTIDA

PARTE II

EDIÇÃO UFRGS 2021/2

Daniel Sergio Presta Garcia
Gabriel Warken
Magno Vargas Bertoglio
Júlia Martins Rodríguez de Azevedo
Thales Mezzacasa Brum

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LABORATÓRIO DE SISTEMA DE TRANSPORTE

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PARTIDA

EDIÇÃO UFRGS 2021/2

PORTO ALEGRE

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

2022

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CAPÍTULO II

EPTG Sul

Caroline Veduim Bevilacqua
Helena Pooli Barbosa
Júlia Martins Rodríguez de Azevedo

Victor Loes Fensterseifer
Daniel Sergio Presta Garcia

REPÚBLICA FEDERATIVA DO BRASIL
UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL – UFRGS
ESCOLA DE ENGENHARIA – EE
DEPARTAMENTO DE ENGENHARIA DE PRODUÇÃO E TRANSPORTES – DEPROT
LABORATÓRIO DE SISTEMAS DE TRANSPORTE – PROGRAMA ProINFRA – PROJETO PONTO DE PARTIDA

PROJETO BÁSICO PARA IMPLANTAÇÃO DE TRECHO RODOVIÁRIO
ENTRE AS CIDADES DE INDEPENDÊNCIA E ALEGRIA

Rodovia:	PPP - 2021/2
Norma Técnica:	DNER/1999
Classe da rodovia:	Classe III
Região:	Montanhosa
Configuração:	pista simples com acostamentos
Classificação do solo:	1ª Categoria
Faixa de exploração:	2 x 250m
Extensão aproximada:	7,004 km

VOLUME 2 – PROJETO EXECUTIVO

EQUIPE AE2 – EPTG Sul
MAIO/2022



DADOS DE IDENTIFICAÇÃO

Instituição: **Universidade Federal do Rio Grande do Sul – UFRGS**

Unidade: **Escola de Engenharia – EE**

Departamento: **Departamento de Engenharia de Produção e Transportes – DEPROT**

Laboratório: **Laboratório de Sistemas de Transportes – LASTRAN**

Programa: **Programa de Desenvolvimento Tecnológico em Infraestrutura de Transportes – ProINFRA**

Projeto: **Ponto de Partida (Trabalho de Graduação da Disciplina de Rodovias)**

Edição: **PPP UFRGS 2021/2**

Ano: **2021**

Semestre: **2**

Disciplina: **Rodovias**

Turma: **A**

Código da Equipe: **AE2**

Nome: **EPTG Sul**

Integrantes do grupo:

(assinatura)

Júlia Martins Rodríguez de Azevedo

(assinatura)

Helena Pooli Barbosa

(assinatura)

Caroline Vedum Bevilacqua

(assinatura)

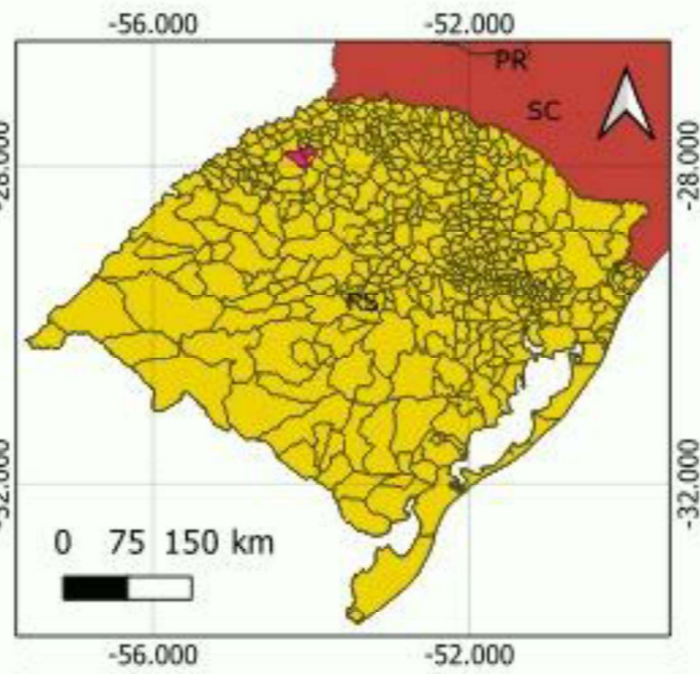
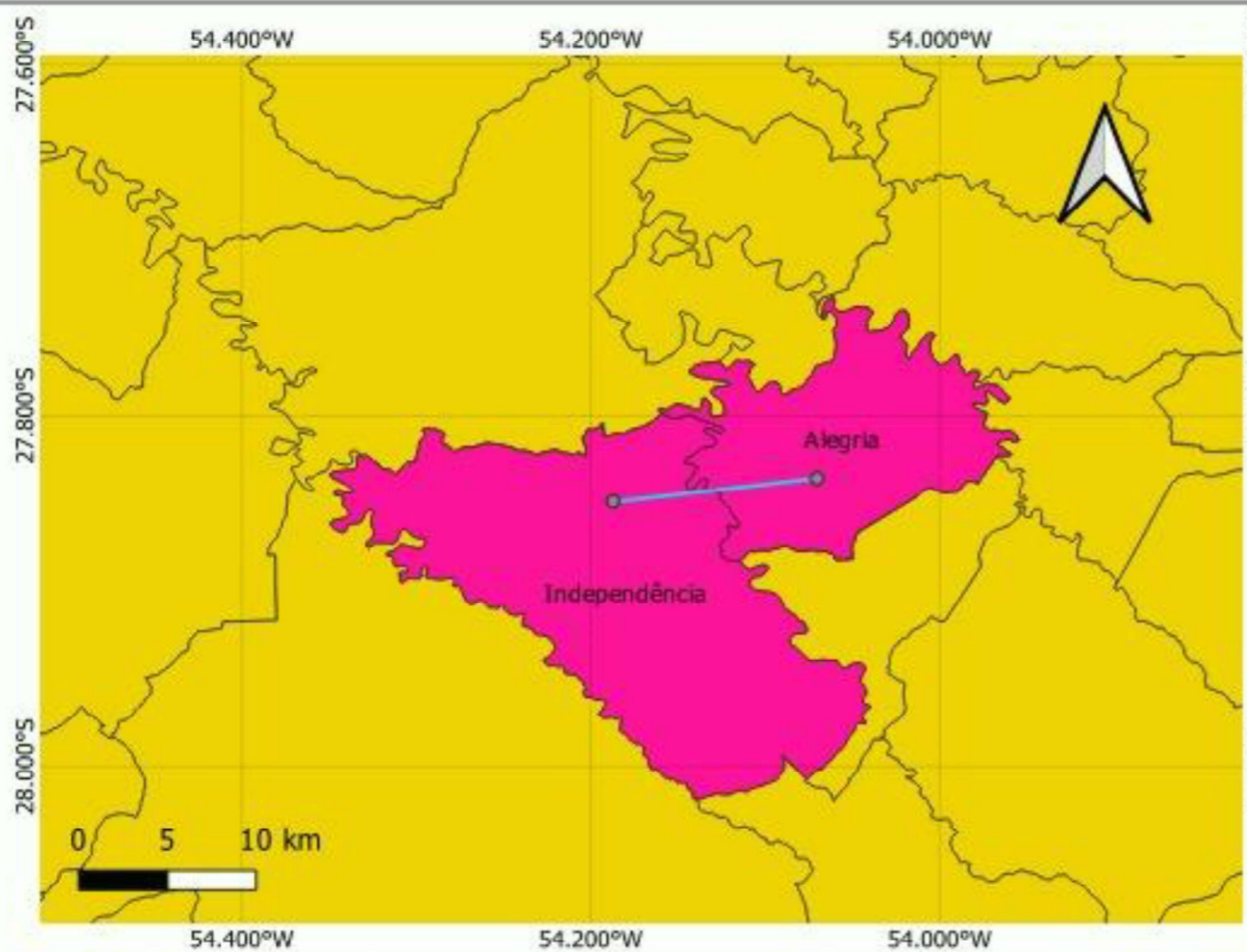
Victor Lopes Fensterseifer

SUMÁRIO

1 APRESENTAÇÃO	6
1.1 Mapa de Situação	6
1.2 Mapa de Localização	8
1.3 Quadro de Características Técnicas	10
2 PROJETO GEOMÉTRICO	13
2.1 Seções Transversais Tipo	13
2.2 Linha Geral	15
2.3 Detalhamento do Projeto Planialtimétrico	17
2.4 Seções Transversais	18
3 PROJETO DE TERRAPLENAGEM	20
3.1 Diagrama de Massa	20
3.2 Quadro de Origem e Destino	22
3.3 Esquema Linear de Distribuição dos Materiais	24

1 APRESENTAÇÃO

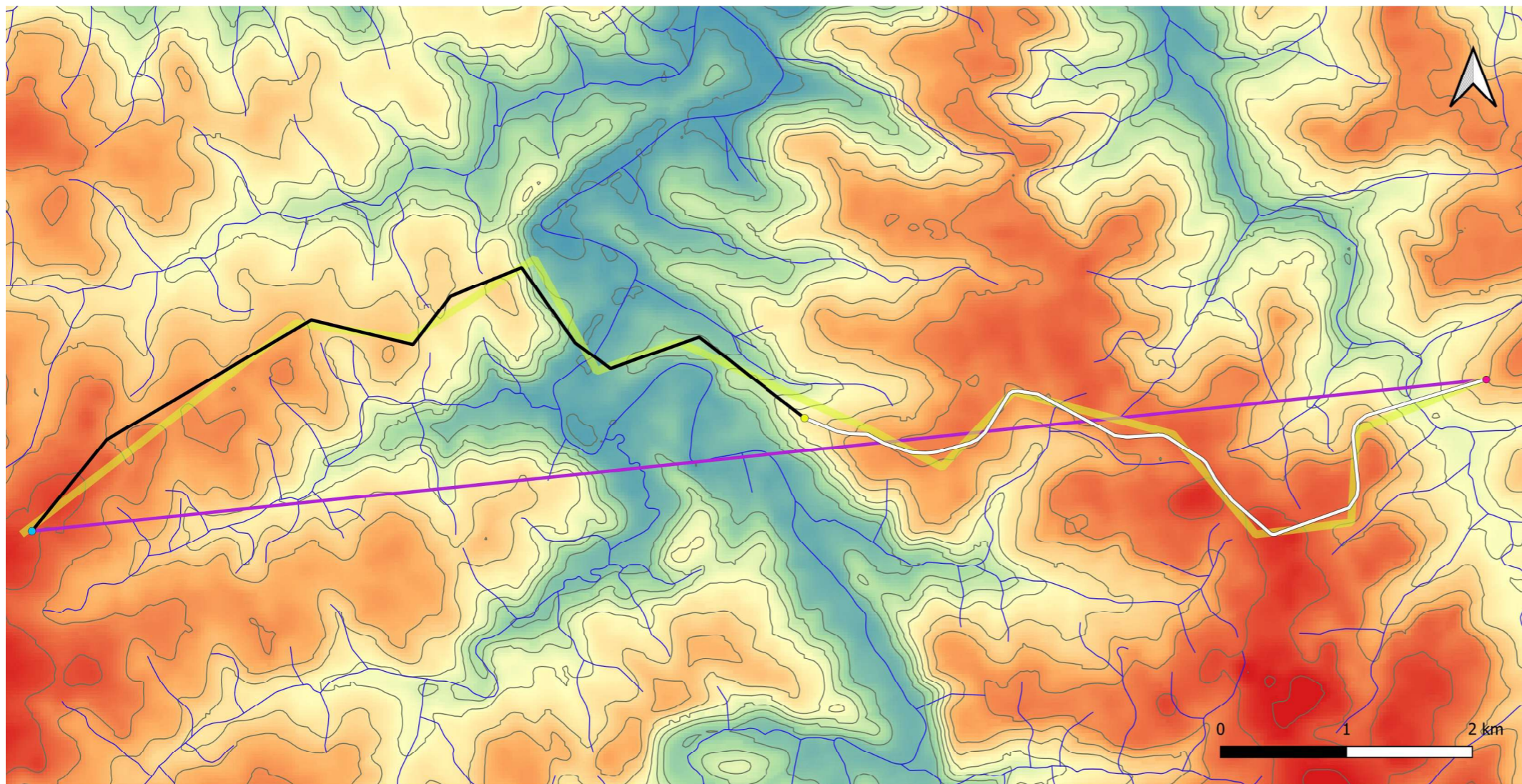
1.1 Mapa de Situação



- Pontos diretriz
- Linha diretriz
- Área de estudo
- Município
- Rio Grande do Sul
- Trecho rodoviário
- Brasil

Base de dados: IBGE, FEPAM
 Autor: Projeto Ponto de Partida
 Sistema de coordenadas geográficas - DATUM SIRGAS
 2000

1.2 Mapa de Localização



- Independência
 - Ponto de Encontro
 - Alegria - Ponto de Partida Lote 2
 - Traçado Lote 1
 - Traçado Lote 2
 - Plano de Voo
 - Diretriz
 - Hidrografia
 - Curvas de Nível
- Elevação**
- 400
200

Base de Dados: IBGE, FEPAM
 Autor: Projeto Ponto de Partida / Equipe
 AE2 - EPTG Sul
 Sistema de Coordenadas Geográficas -
 Datum: SIRGAS 20000

1.3 Quadro de Características Técnicas

CARACTERÍSTICAS TÉCNICAS

Rodovia: Grupo de Eixos 1
 Trecho: Eixo1
 Segmento: km: 0+000,00 ao km: 7+004,30

CARACTERÍSTICAS GERAIS

DE PROJETO		PLANIALTIMÉTRICAS				SEÇÕES TRANSVERSAIS			
NORMA	DNIT	RAIO MIN. COM TRANS.	50,000	K MIN/DES CÔNCAVA	7 / 7	LARG. PISTA DE ROL.		PLATAFORMA ATERRO	
CLASSE DA RODOVIA	III	RAIO MIN. SIMPLES	300,000	K MIN/DES CONVEXA	5 / 5	LARG. ACOST. INT.		PLATAFORMA CORTE	
REGIÃO	Montanhosa	RAMPA MÁXIMA	8,000	DIST. VIS. PARADA		LARG. ACOST. EXT.		TALUDE ATERRO	
VELOCIDADE DIRETRIZ	40	RAMPA MÍNIMA	0,300	DIST. VIS. ULTRAP.		ABAUAMENTO		TALUDE CORTE 1ª CAT.	
		EXTENSÃO TOTAL	7004,299	FAIXA DOM. (LE/LD+OFF)	25 / 25 + 5	SUPERELEVÇÃO MÁX.		TALUDE CORTE 3ª CAT.	

PLANIMETRIA

DISTRIBUIÇÃO DE CURVAS

T R A N S I Ç Ã O	RAIOS (m)		FREQ.	Dc (m)	%	Lc1+Lc2 (m)	%
	R	R mínimo =	125,000	1	36,732	0,52	70,000
A	125,000 < R ≤	100,000					
N	100,000 < R ≤	200,000	11	725,798	10,36	1420,000	20,27
S	200,000 < R ≤	300,000	2	140,486	2,01	290,000	4,14
I	300,000 < R ≤	500,000					
Ç	R >	500,000					
.	TOTAL EM TRANSIÇÃO		14	903,015	12,89	1780,000	25,41

S I M P L E S	RAIOS (m)		FREQ.	Dc (m)	%		
	R	R mínimo =	1000000,000				
M	1000000,000 < R ≤	500,000					
P	500,000 < R ≤	700,000					
L	700,000 < R ≤	1000,000					
E	1000,000 < R ≤	1500,000					
S	R >	1500,000					
	TOTAL SIMPLES						
	TOTAL EM CURVA		14	903,015	12,89	3586,030	51,20

EXTENSÃO DAS INTERTANGENTES

MÍNIMA		MÁXIMA		TOTAL	
EXTENSÃO (m)	%	EXTENSÃO (m)	%	EXTENSÃO (m)	%
162,385	2,32	664,466	9,49	4321,284	61,69

PARÂMETROS PLANIMÉTRICOS

TORTUOSIDADE		DISTÂNCIA EM DIRETRIZ	
TOTAL (°/m)	MÉDIA (°/m.km)	EXTENSÃO (m)	ACRÉSCIMO (%)
2,854	0,408	5426,749	29,070

ALTIMETRIA

VARIAÇÃO ALTIMÉTRICA

ACLIVES			NÍVEL		DECLIVES		
INTERVALO	EXTENSÃO (m)	%	EXTENSÃO	%	INTERVALO	EXTENSÃO (m)	%
0 < i ≤ 1	851,557	12,16			0 < i ≤ 1		
1 < i ≤ 2					1 < i ≤ 2		
2 < i ≤ 3	480,000	6,85			2 < i ≤ 3	1482,355	21,16
3 < i ≤ 4	86,764	1,24			3 < i ≤ 4	343,771	4,91
4 < i ≤ 5					4 < i ≤ 5		
5 < i ≤ 6					5 < i ≤ 6	125,553	1,79
6 < i ≤ 7	105,000	1,50			6 < i ≤ 7		
7 < i ≤ 8	660,000	9,42			7 < i ≤ 8	598,855	8,55
8 < i ≤ 9					8 < i ≤ 9	370,444	5,29
9 < i ≤ 10					9 < i ≤ 10		
i > 10					i > 10		
TOTAL	2183,321	31,17			TOTAL	2920,978	41,70

EXTENSÃO DOS ELEMENTOS VERTICAIS

RAMPA		CURVA CÔNCAVA		CURVA CONVEXA		CURVA TOTAL	
EXTENSÃO (m)	%	EXTENSÃO (m)	%	EXTENSÃO (m)	%	EXTENSÃO (m)	%
5104,299	72,87	1030,000	14,71	870,000	12,42	1900,000	27,13

PARÂMETROS K MÍNIMOS ADOTADOS

EM CURVA CÔNCAVA	24,695	EM CURVA CONVEXA	20,850
------------------	--------	------------------	--------

PARÂMETROS ALTIMÉTRICOS

COMPRIMENTO VIRTUAL IDA		COMPRIMENTO VIRTUAL VOLTA		COMPRIMENTO VIRTUAL MÉDIO	
EXTENSÃO (m)	%	EXTENSÃO (m)	%	EXTENSÃO (m)	%
13000,425	185,61	14578,296	208,13	13789,360	196,87

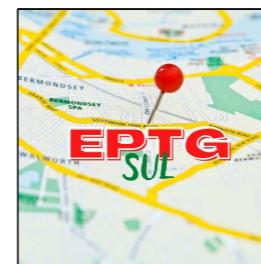
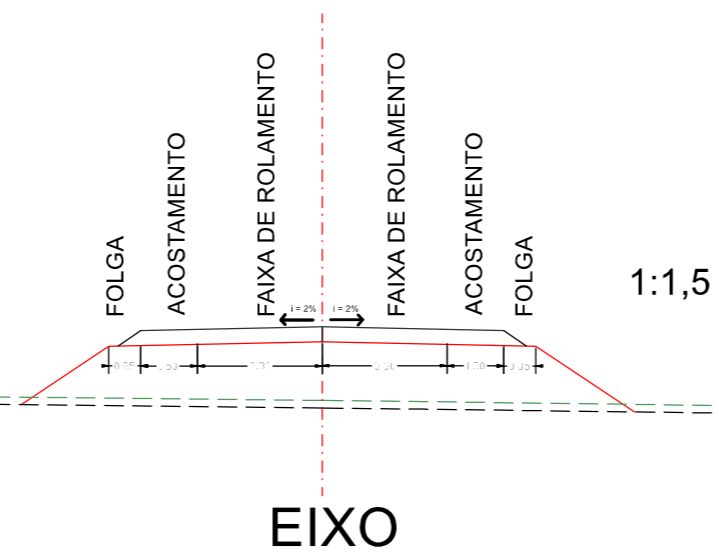
CARACTERÍSTICAS OPERACIONAIS

ANO DE ABERTURA		VDM ABERTURA		PARÂMETRO			
ANO FINAL DA VIDA ÚTIL		VDM FINAL					

2 PROJETO GEOMÉTRICO

2.1 Seções Transversais Tipo

SEÇÃO DE ATERRO



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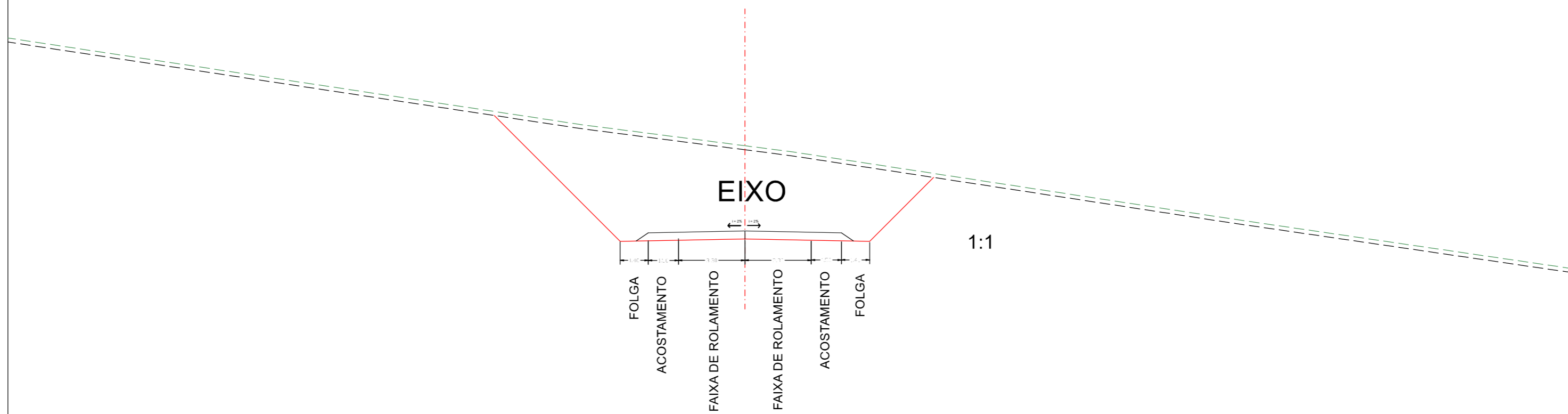
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 Trecho: Lote 2
 Data: 04/05/2022

Escala:
 1:4000

SEÇÕES TRANSVERSAIS TIPO

Código:
 01/07

SEÇÃO DE CORTE



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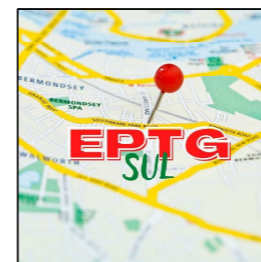
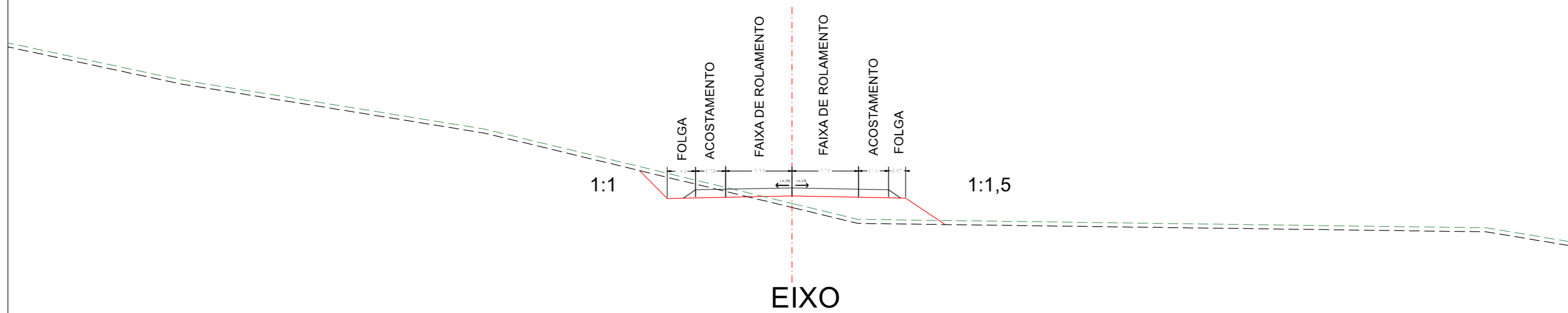
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Trecho: Lote 2
Data: 04/05/2022

Escala:
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SEÇÕES TRANSVERSAIS TIPO

Código:
02/07

SEÇÃO MISTA



UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
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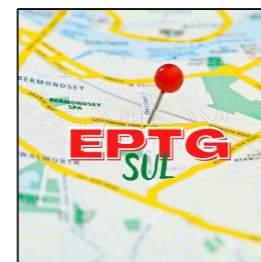
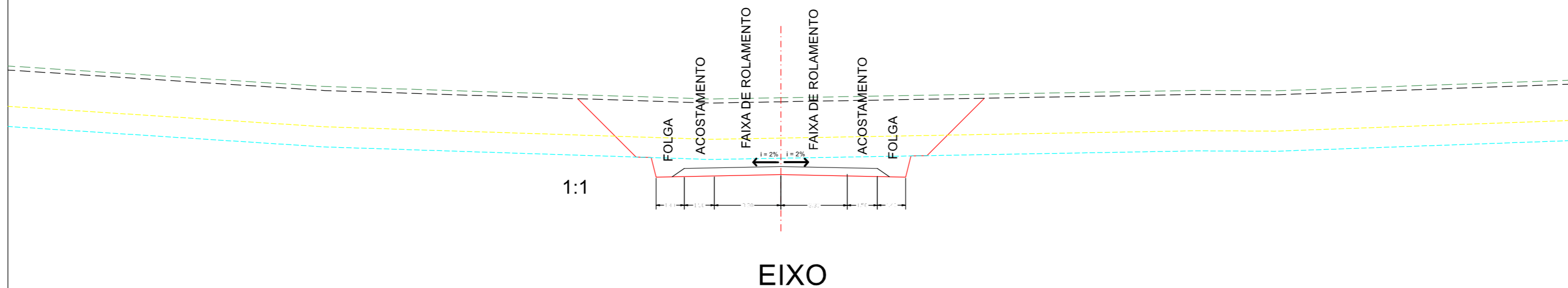
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Trecho: Lote 2
Data: 04/05/2022

Escala:
1:4000

SEÇÕES TRANSVERSAIS TIPO

Código:
03/07

SEÇÃO COM CORTE EM ROCHA



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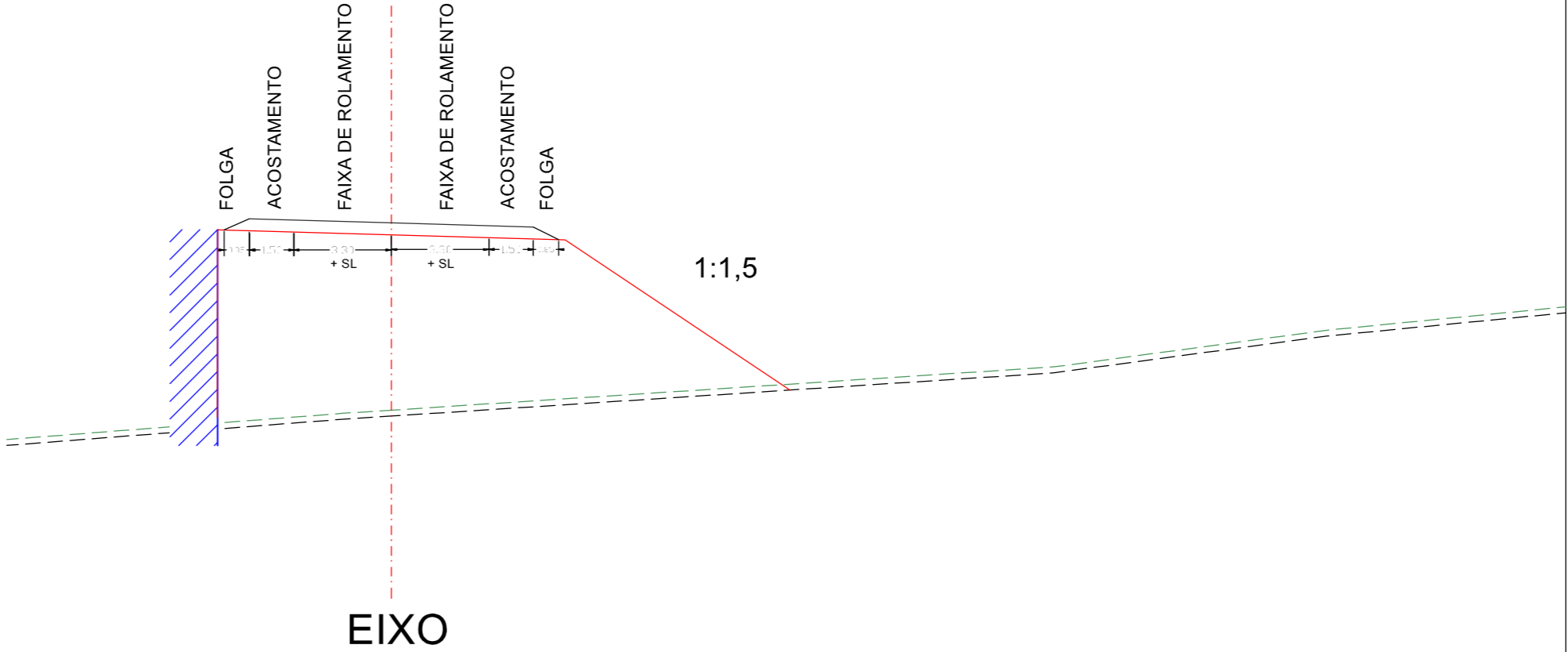
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 Trecho: Lote 2
 Data: 04/05/2022

Escala:
 1:4000

SEÇÕES TRANSVERSAIS TIPO

Código:
 04/07

SEÇÃO DE ATERRO COM MURO DE ARRIMO LE



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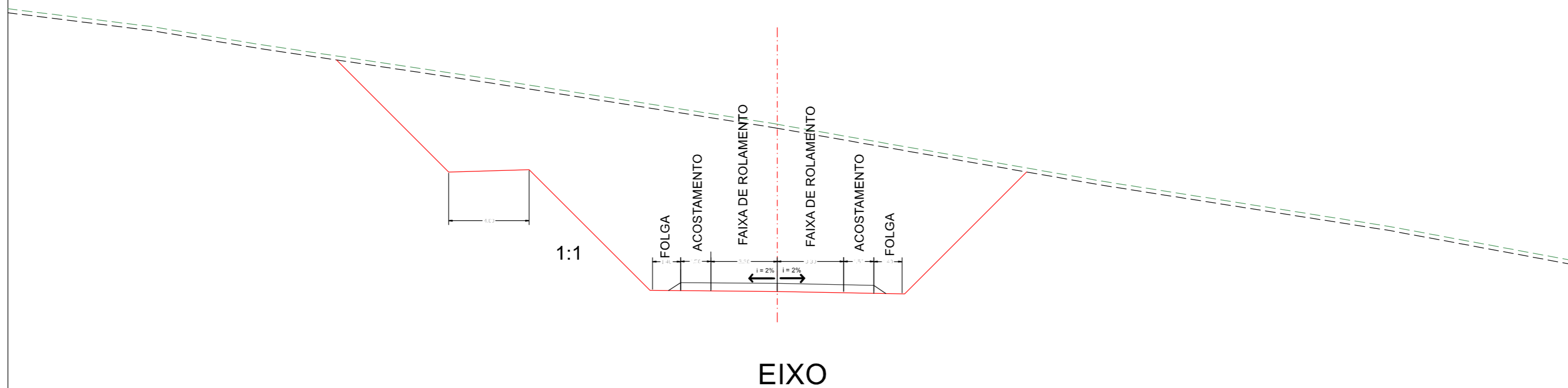
Rodovia: PPP - UFRGS - 2021/2
 Trecho: Lote 2
 Data: 04/05/2022

Escala:
 1:4000

SEÇÕES TRANSVERSAIS TIPO

Código:
 05/07

SEÇÃO DE CORTE COM BANQUETAS



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Laboratório de Sistemas de Transportes - LASTRAN

Rodovia: PPP - UFRGS - 2021/2

Trecho: Lote 2

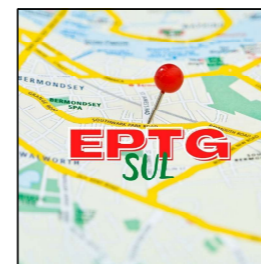
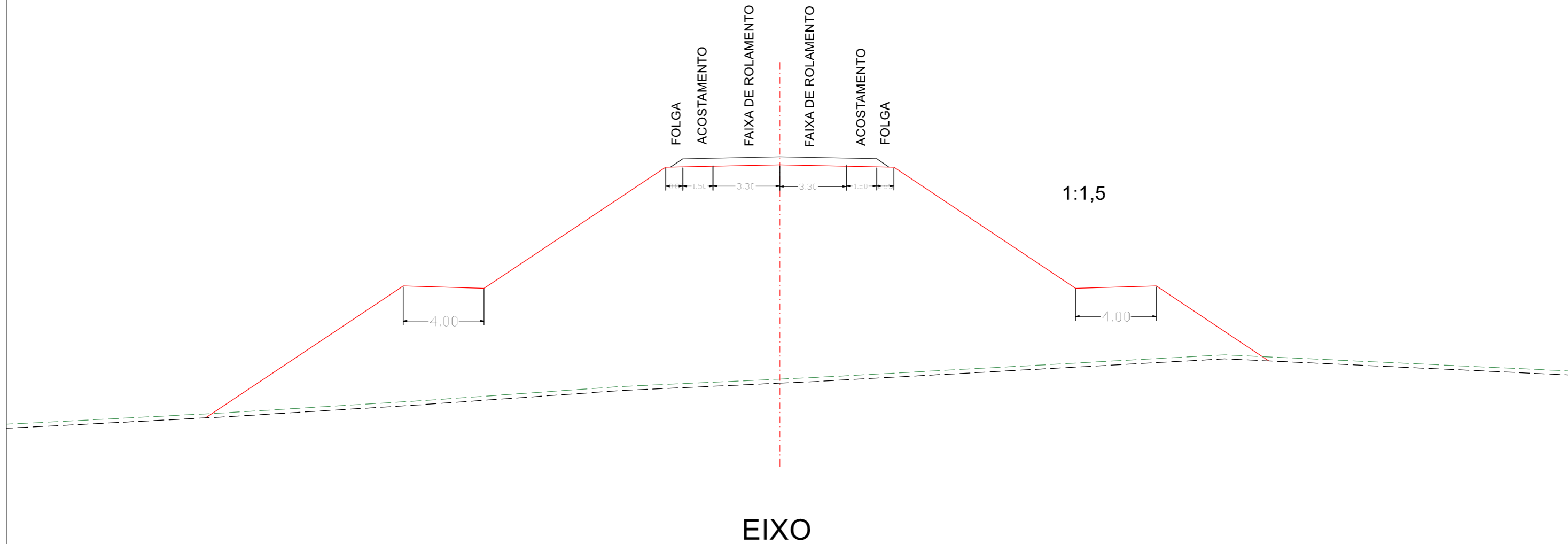
Data: 04/05/2022

Escala:
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SEÇÕES TRANSVERSAIS TIPO

Código:
06/07

SEÇÃO DE ATERRO COM BANQUETAS



UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
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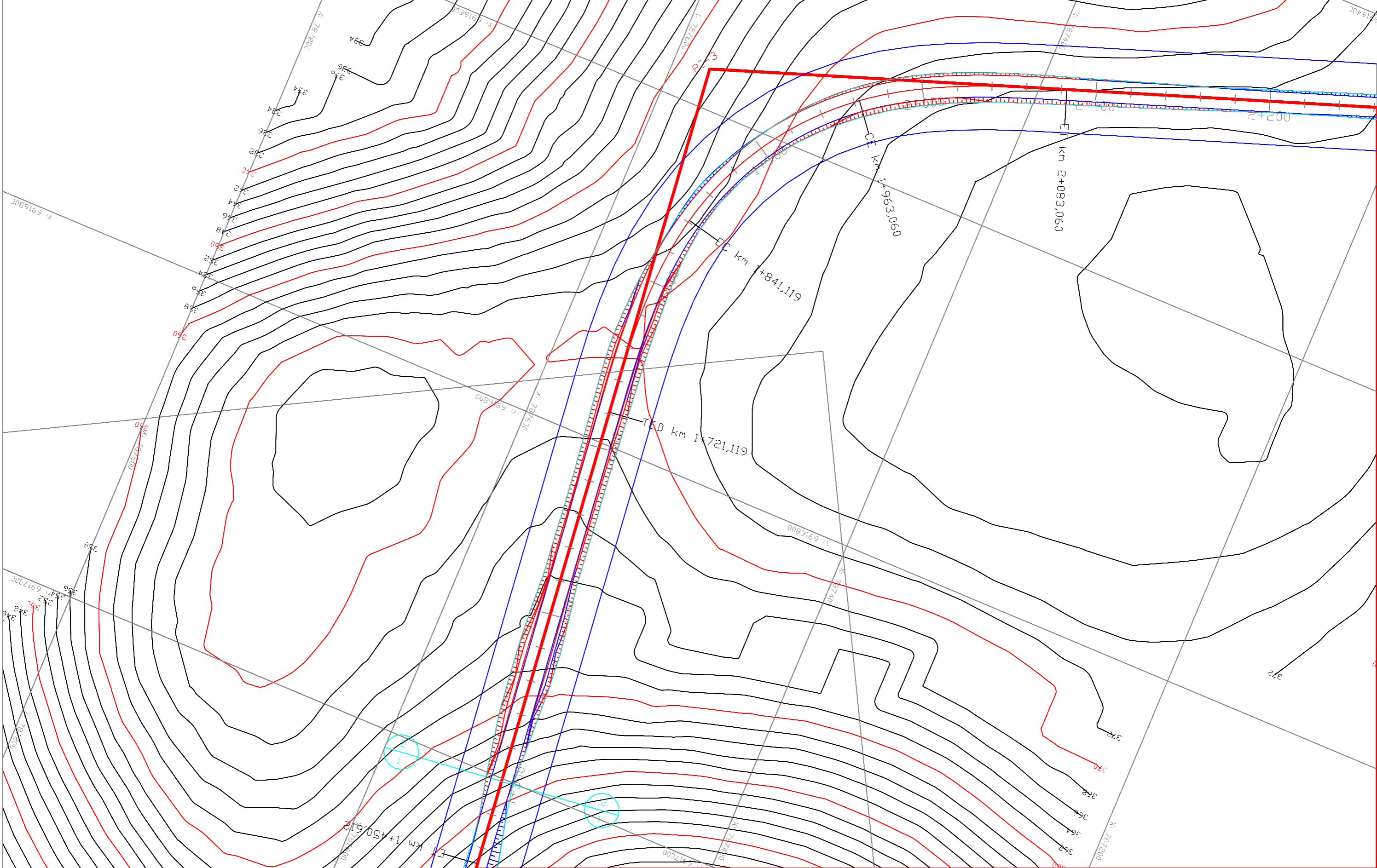
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 Trecho: Lote 2
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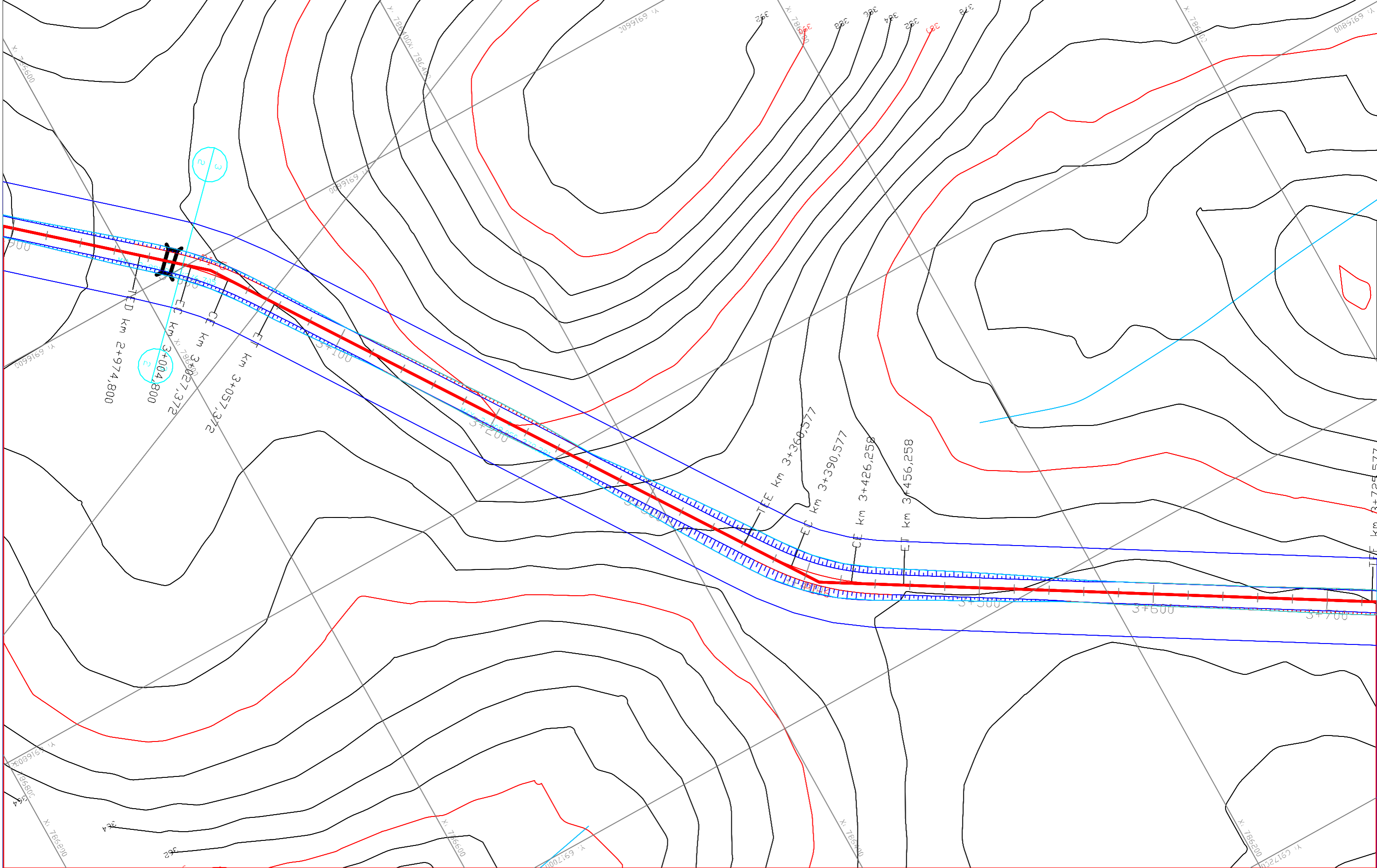
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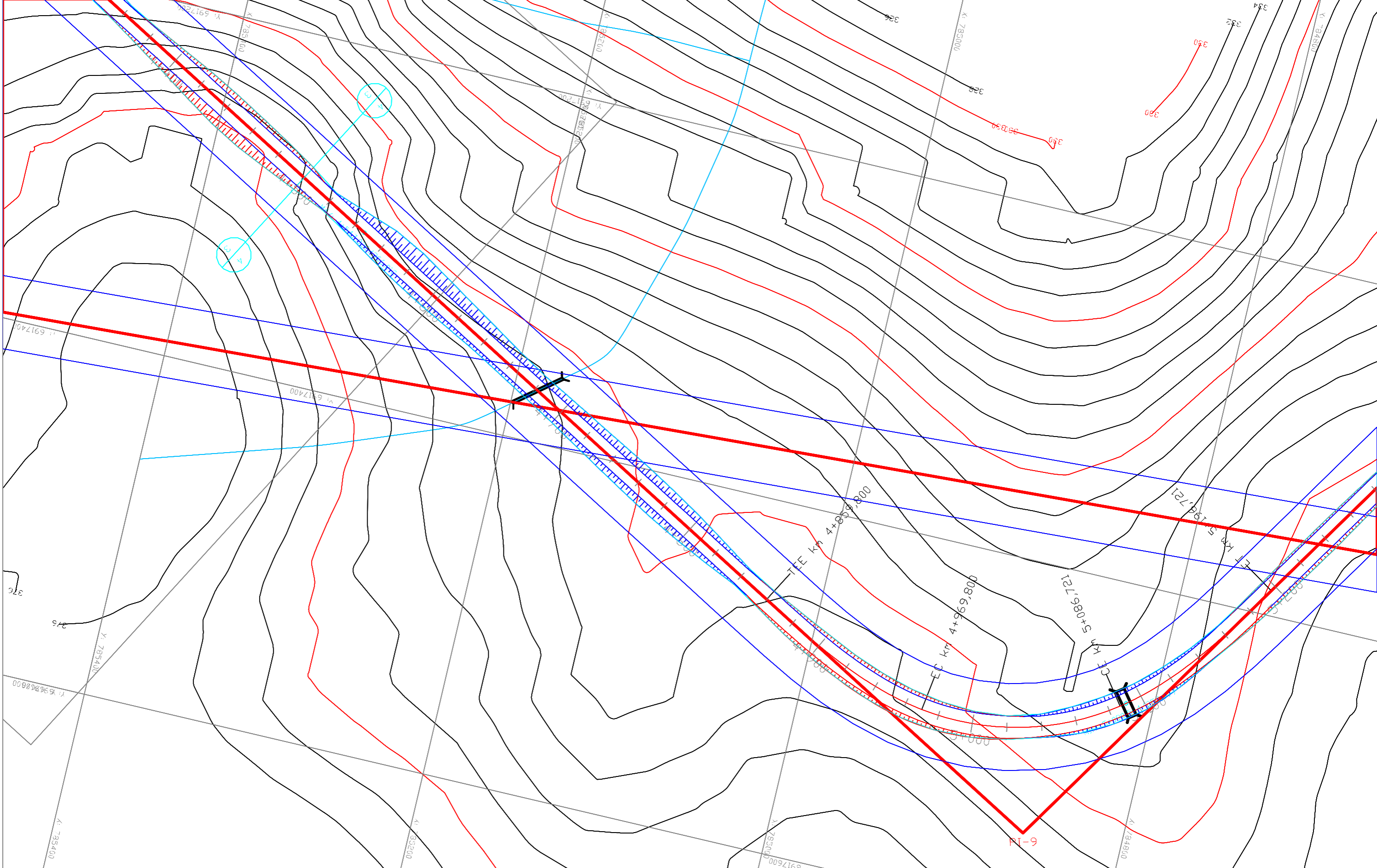
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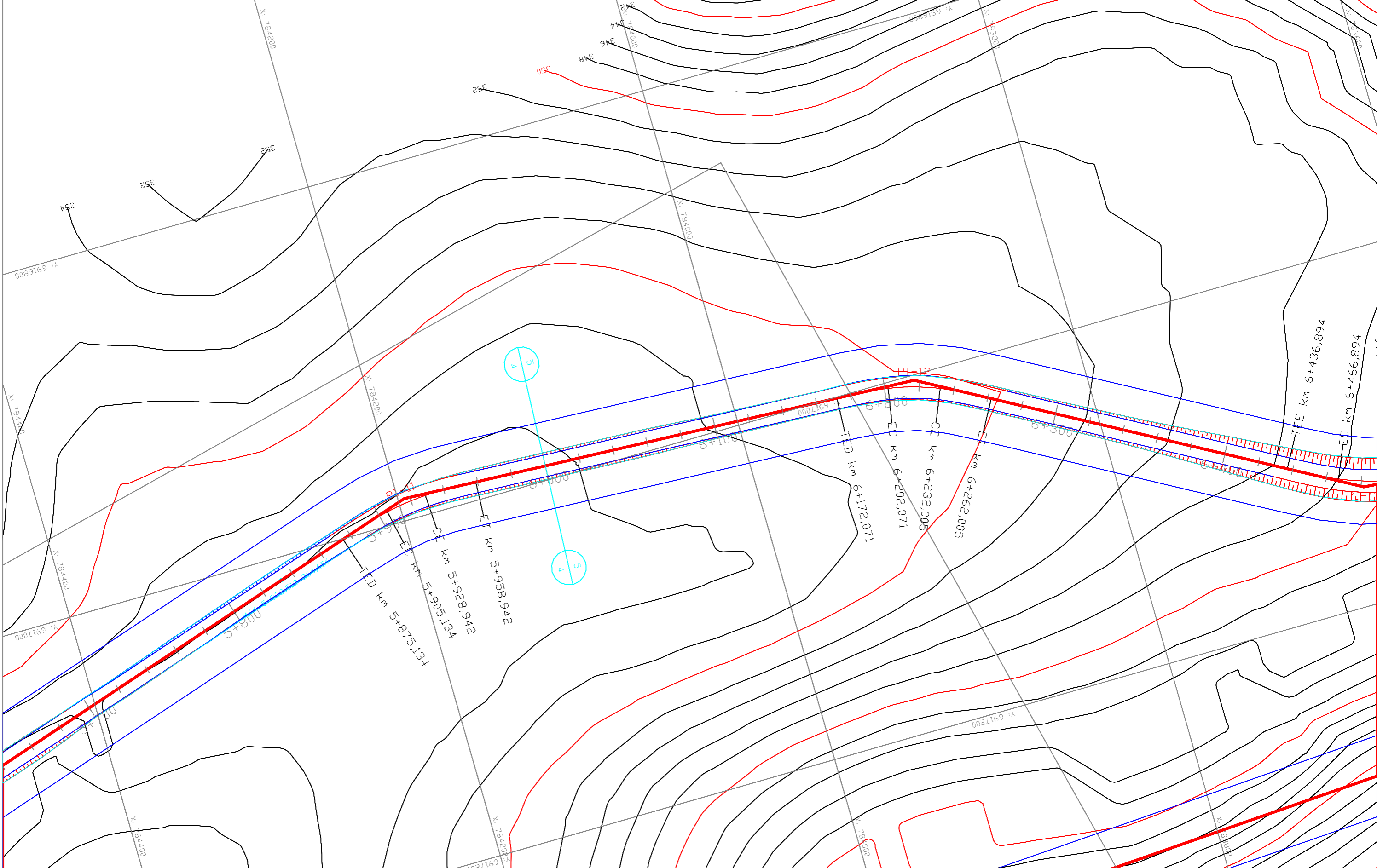
Código:
 07/07

2.2 Linha Geral

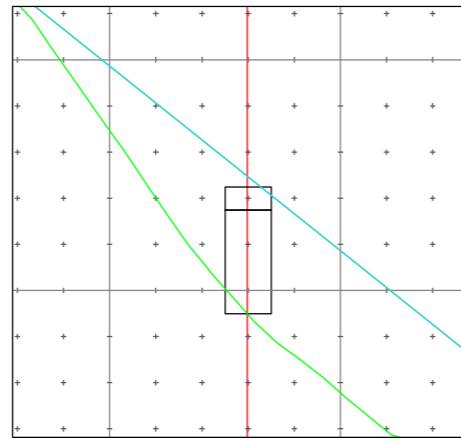
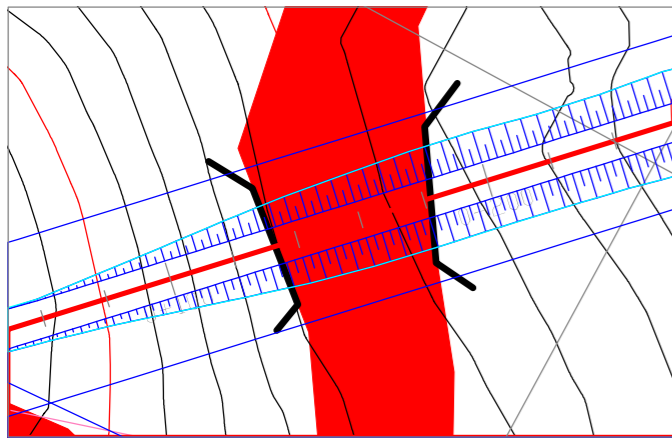








2.3 Detalhamento do Projeto Planialtimétrico



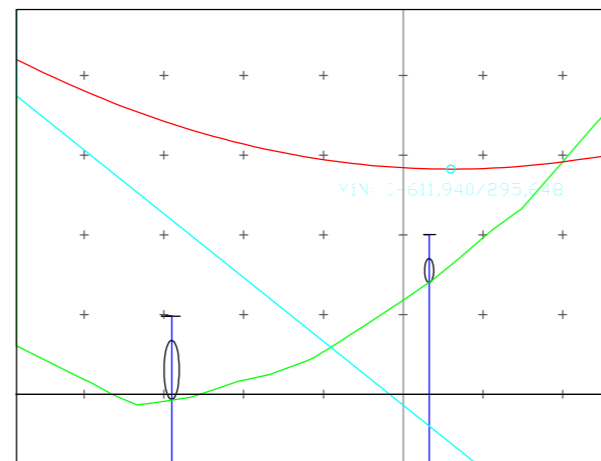
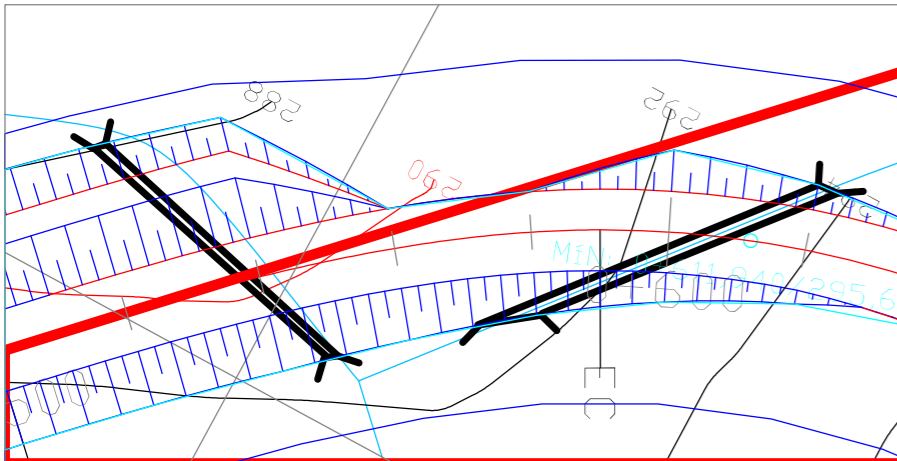
PASSAGEM SUPERIOR

Solução para a passagem da via existente e da rodovia no mesmo local

Estaca: 0+160,00

Cota do terreno: 318,944

Cota do projeto: 324,925



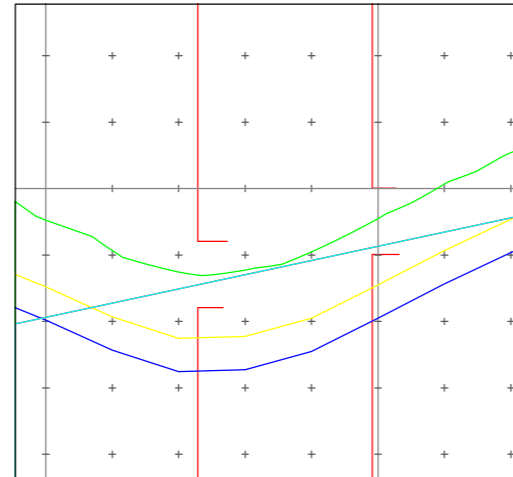
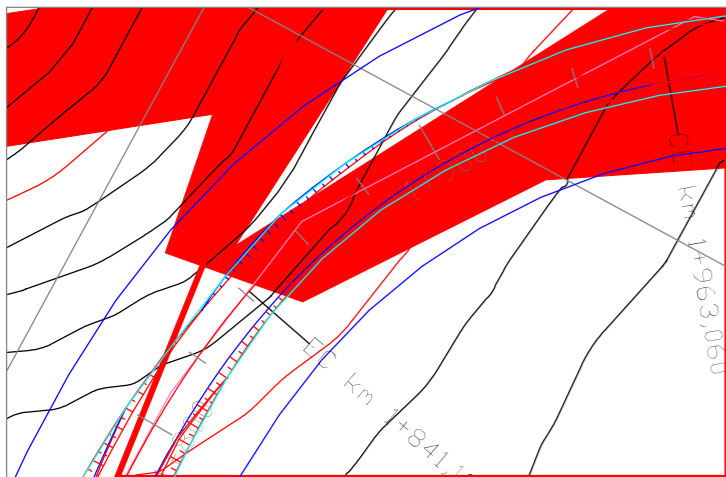
BUEIRO 1 e 2

Bueiro com solução de projeto para córrego (esquerda) e bueiro com solução de projeto para córrego e ponto de cota mínima (direita)

Estaca: 0+542,001 (dir)
0+606,512 (esq)

Cota do terreno: 289,853 (esq)
e 289,853 (esq)

Cota do projeto: 296,786 (esq) e
295,655 (dir)




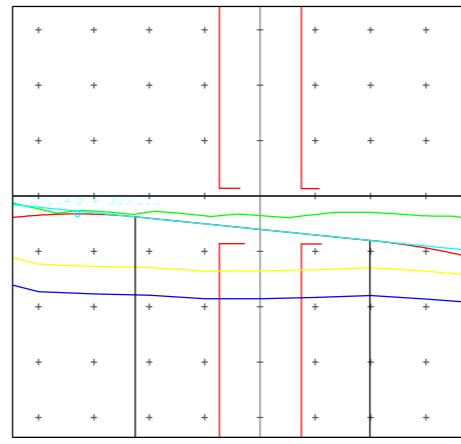
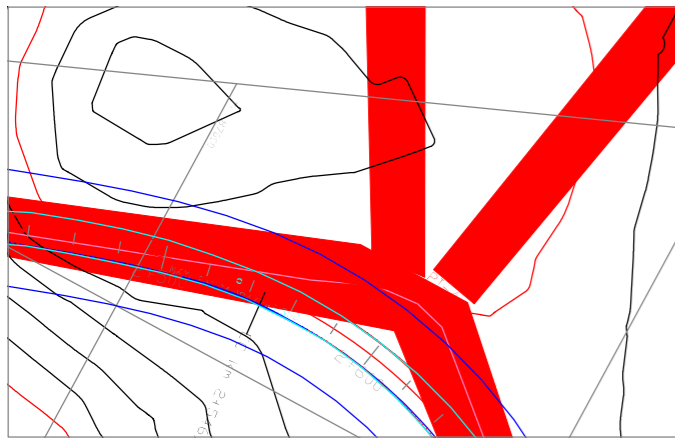
VIA EXISTENTE 1 e 2

Estaca: 1+845,741 (esq) e 1+900,00 (dir)

Cota do terreno: 367,393 (esq) e 369,005 (dir)

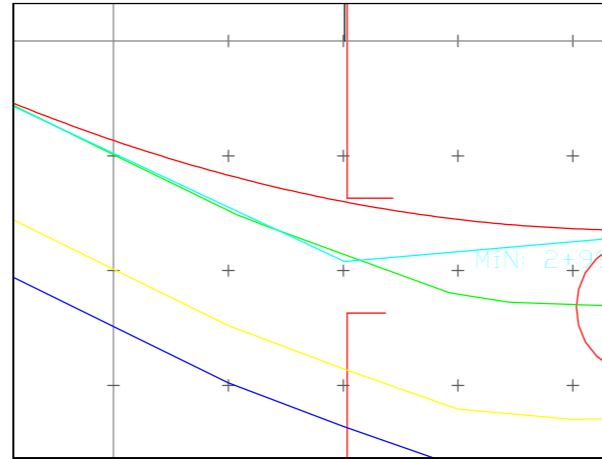
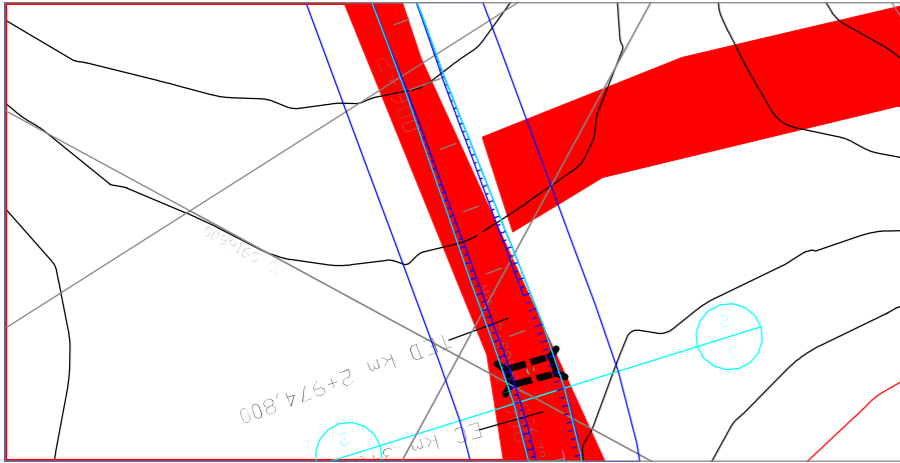
Cota do projeto: 367,009 (esq) e 368,225 (dir)

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	Rodovia: PPP - UFRGS - 2021/2 Trecho: Lote 2 Data: 04/05/2022
Escala: 1:2000	DETALHAMENTO DE INTERFERÊNCIAS
	Código: 1114



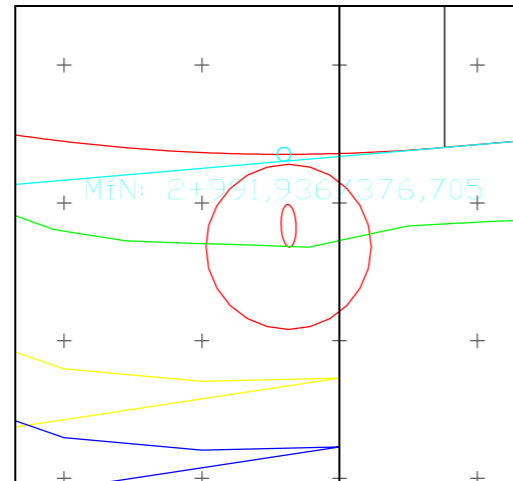
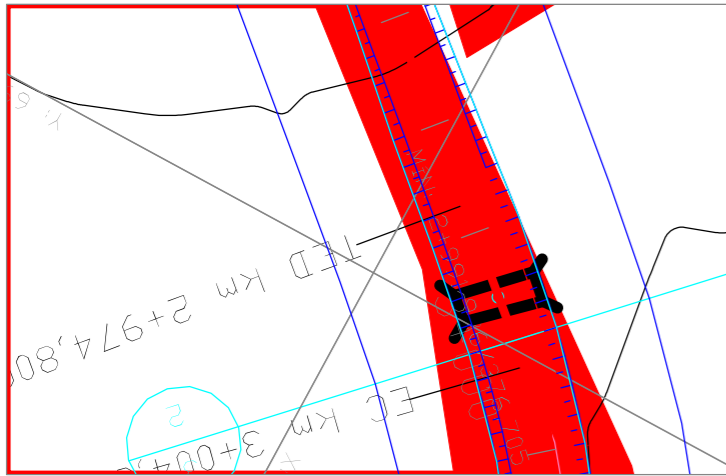
VIA EXISTENTE 3 e 4

Estaca: 2+585,393 (esq) e 2+615,022 (dir)
 Cota do terreno: 389,293 (esq) e 389,271 (dir)
 Cota do projeto: 388,943 (esq) e 388,646 (dir)



VIA EXISTENTE 5


Estaca: 2+940,00
 Cota do terreno: 376,263
 Cota do projeto: 377,191

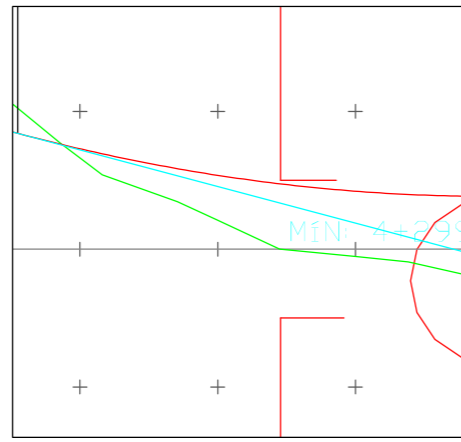
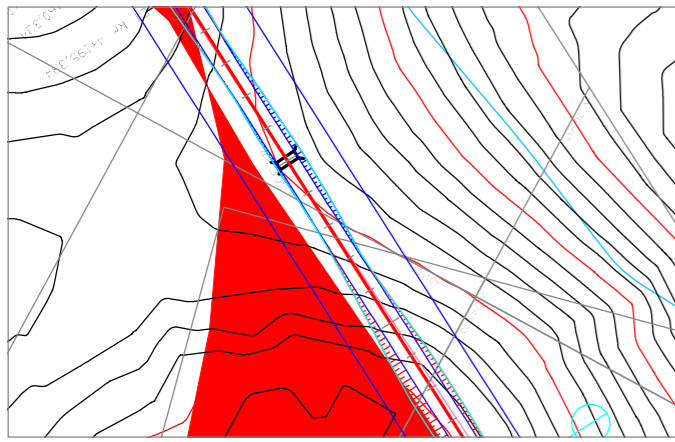


BUEIRO 3

Bueiro com solução de projeto
 para ponto de cota mínima

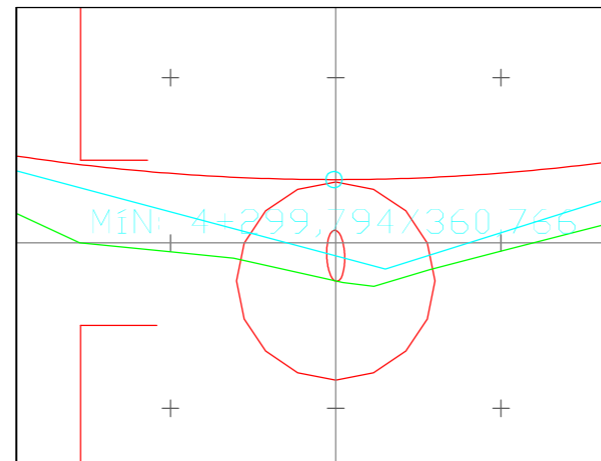
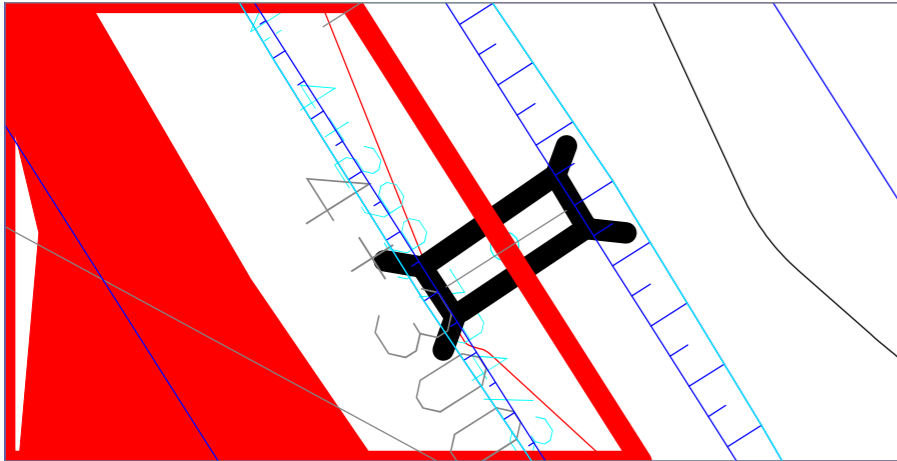
Estaca: 2+991,936
 Cota do terreno: 375,371
 Cota do projeto: 376,705

 EPTG S/A	UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL Instituto de Engenharia de Produção e Transportes Laboratório de Estudos de Transportes - LESTRAN
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Escala: 1:2000	DETALHAMENTO DE INTERFERÊNCIAS
Código: 134	



VIA EXISTENTE 6

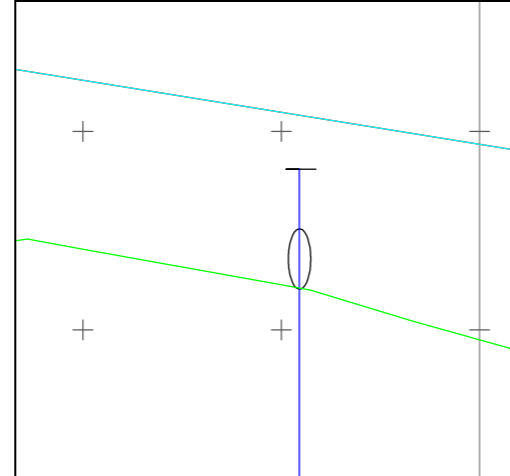
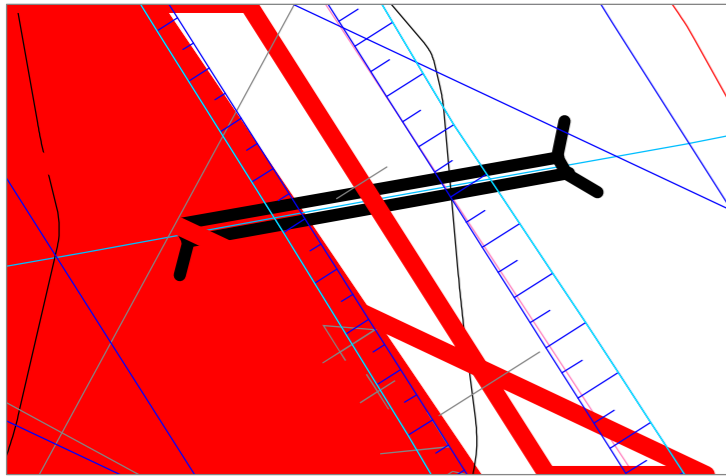
Estaca: 4+269,151
 Cota do terreno: 360,002
 Cota do projeto: 360,948



BUEIRO 4

Bueiro com solução de projeto
 para ponto de cota mínima

Estaca: 4+299,794
 Cota do terreno: 359,539
 Cota do projeto: 360,766

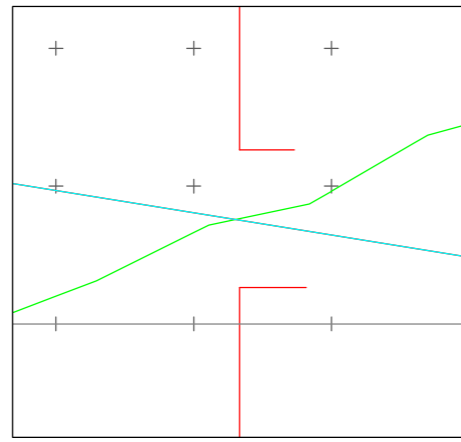
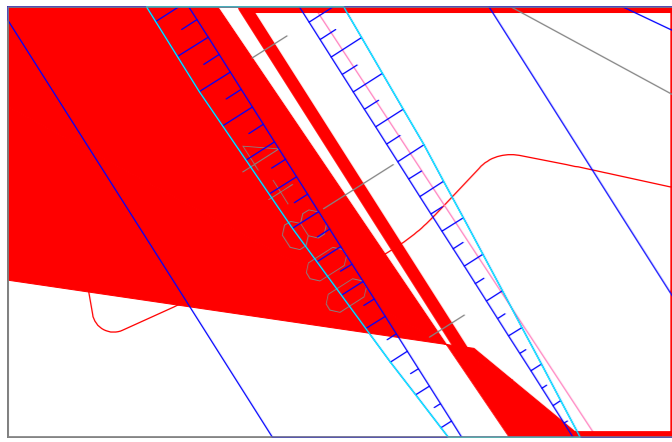


BUEIRO 5

Bueiro com solução de projeto
 para córrego

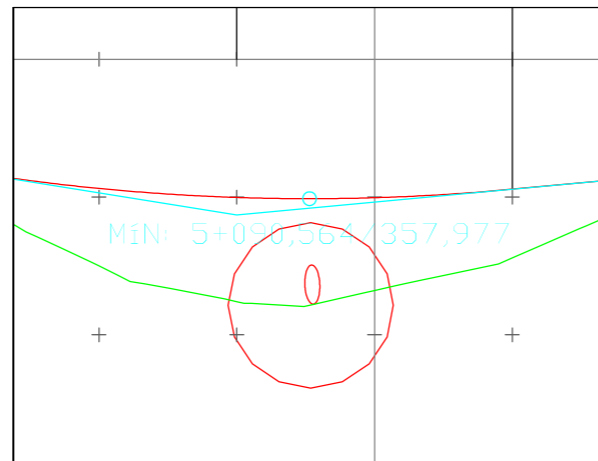
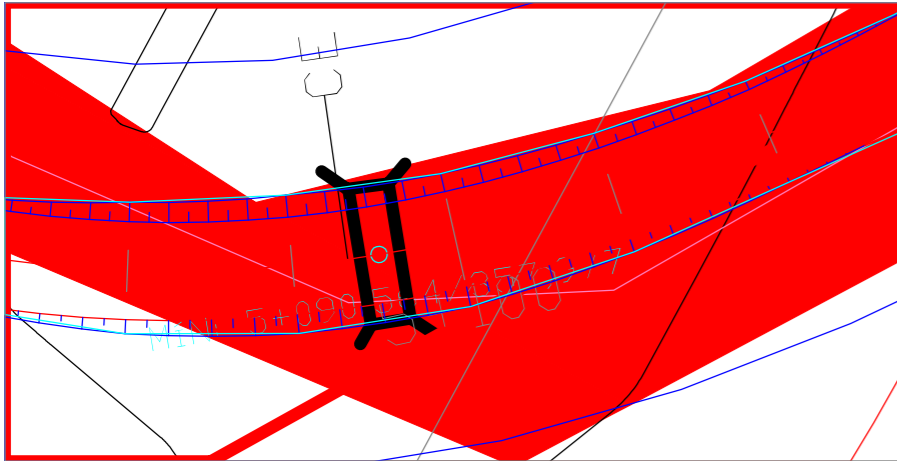
Estaca: 4+681,833
 Cota de terreno: 362,421
 Cota do projeto: 364,165

	UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL Instituto de Engenharia de Produção e Transportes Laboratório de Estudos de Transportes - ESTRAN
	Rodovia: PPP - UFRGS - 2021/2 Trecho: Lote 2 Data: 04/05/2022
Escala: 1:2000	DETALHAMENTO DE INTERFERÊNCIAS
	Folha: 134.4 190



VIA EXISTENTE 7

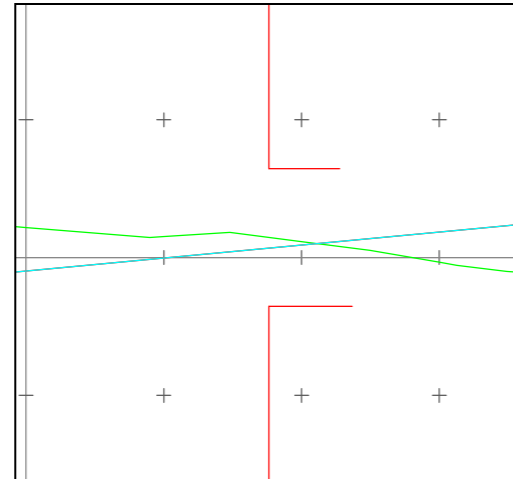
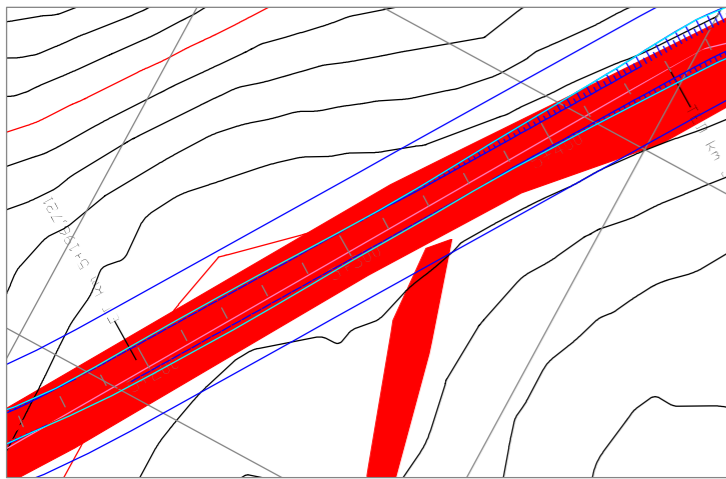
Estaca: 4+846,653
 Cota do terreno: 361,528
 Cota do projeto: 361,505



BUEIRO 6

Bueiro com solução de projeto
 para ponto de cota mínima

Estaca: 5+090,564
 Cota do terreno: 356,429
 Cota do projeto: 357,977

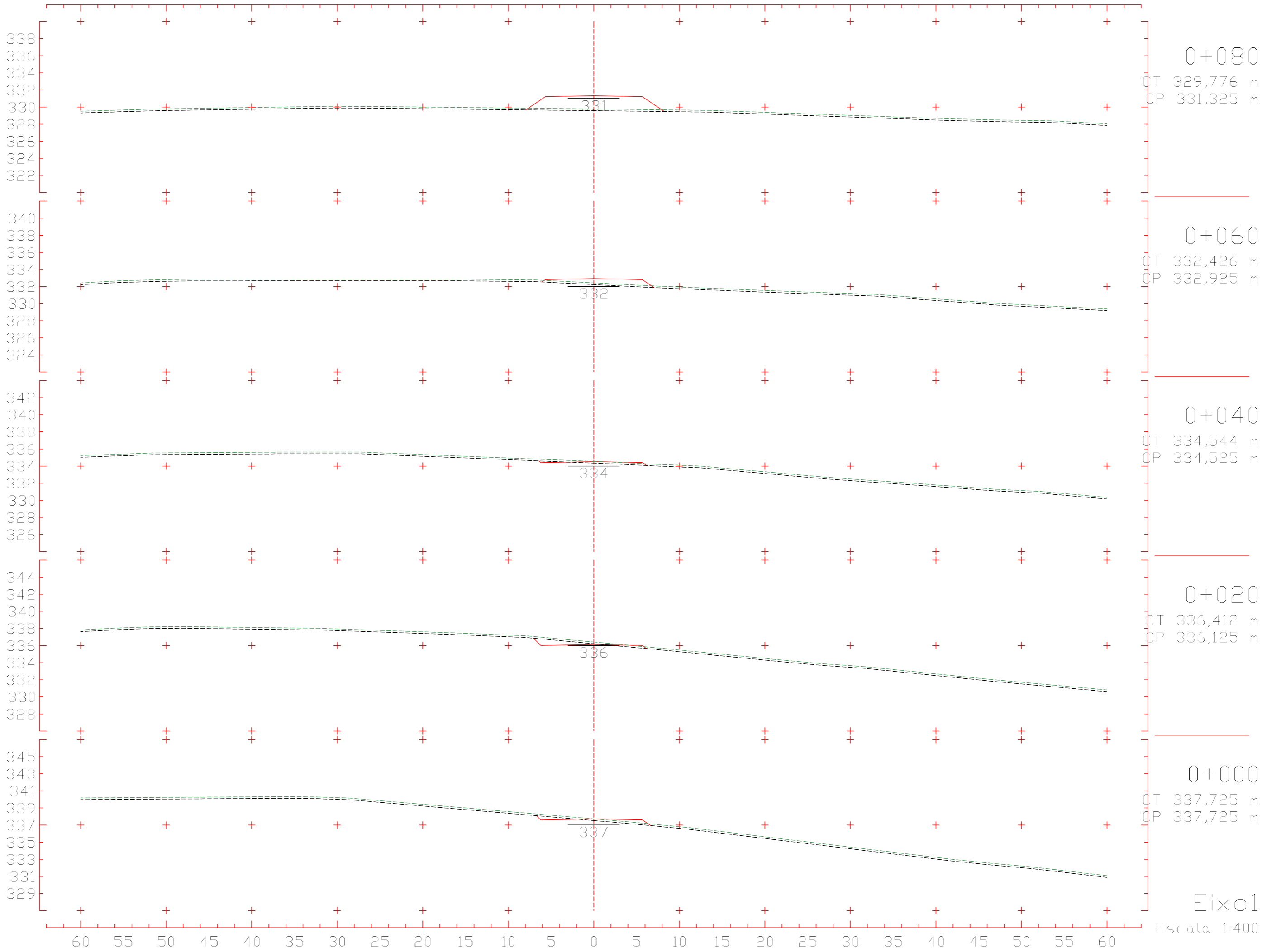


VIA EXISTENTE 8

Estaca: 5+335,231
 Cota do terreno: 360,293
 Cota do projeto: 360,137

	UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL INSTITUTO DE ENGENHARIA DE TRANSPORTES E TRANSPORTES LABORATÓRIO DE SISTEMAS DE TRANSPORTES - ASTRA
	Rodovia: PPP - UFRGS - 2021/2 Trecho: Lote 2 Data: 04/05/2022
Escala: 1:2000	DETALHAMENTO DE INTERFERÊNCIAS
	Folha: 14.4 191

2.4 Seções Transversais



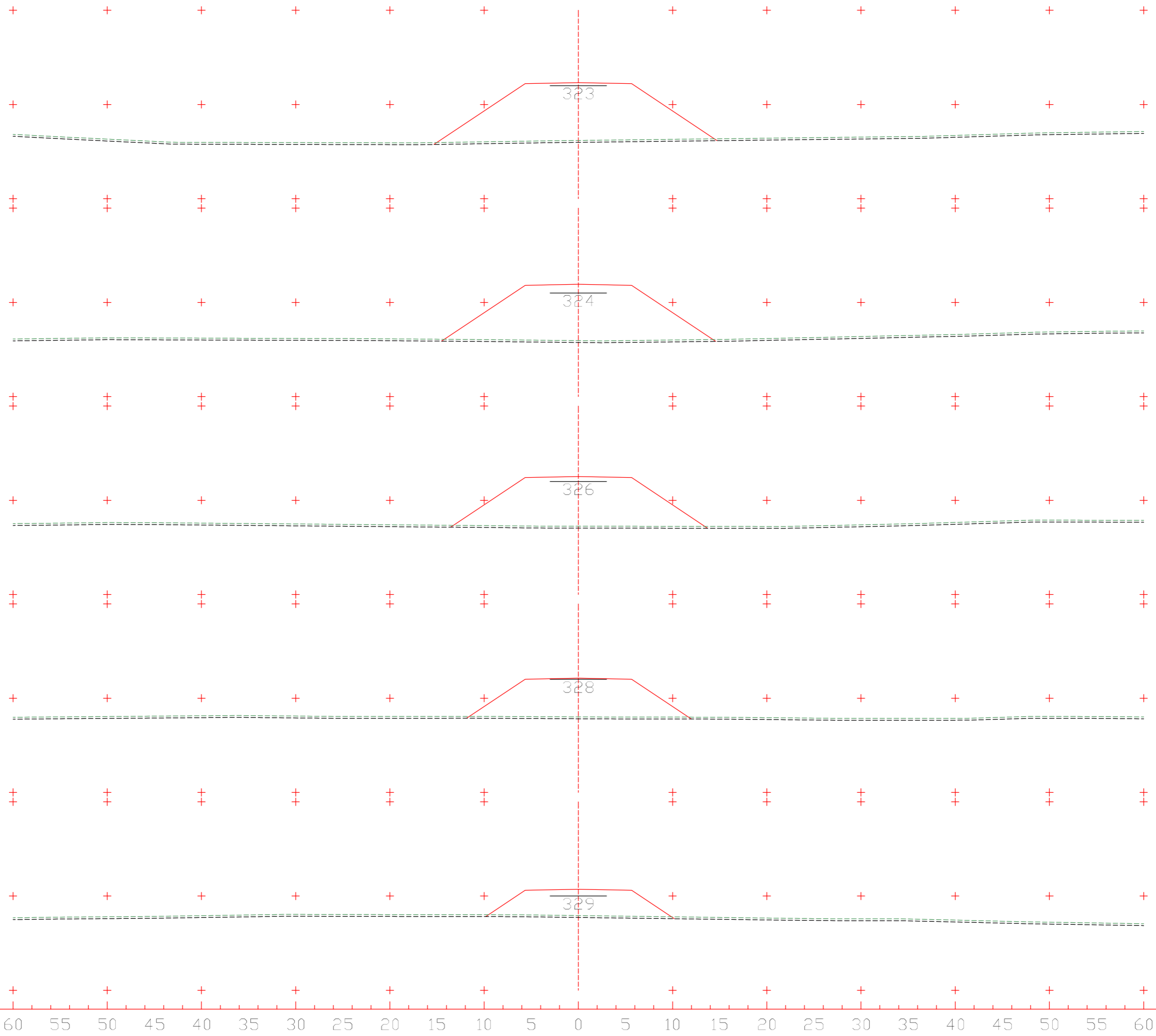
329
327
325
323
321
319
317
315
313

331
329
327
325
323
321
319
317
315

332
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326
324
322
320
318
316

334
332
330
328
326
324
322
320
318

337
335
333
331
329
327
325
323
321



0+180
CT 317,185 m
CP 323,325 m

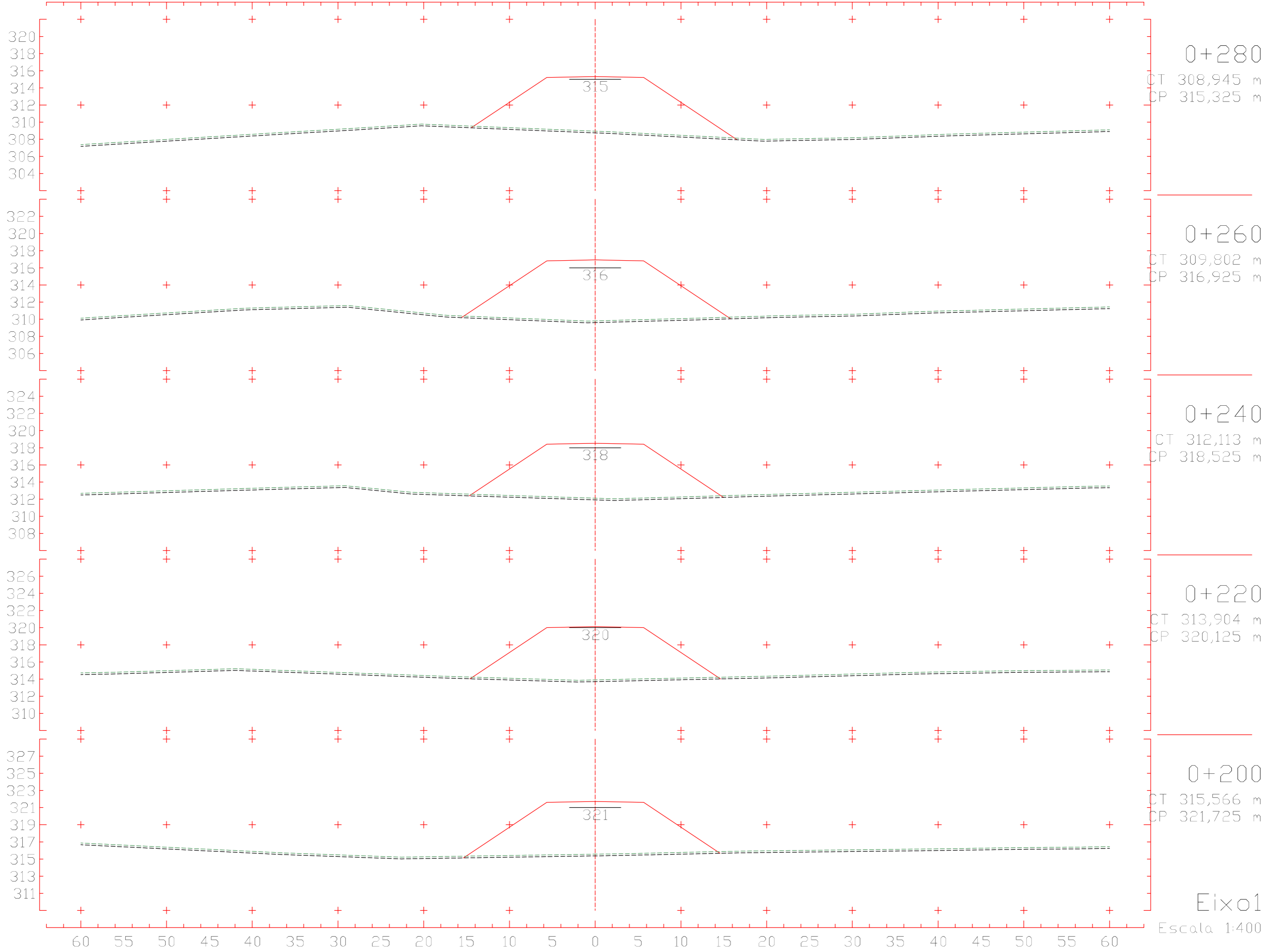
0+160
CT 318,944 m
CP 324,925 m

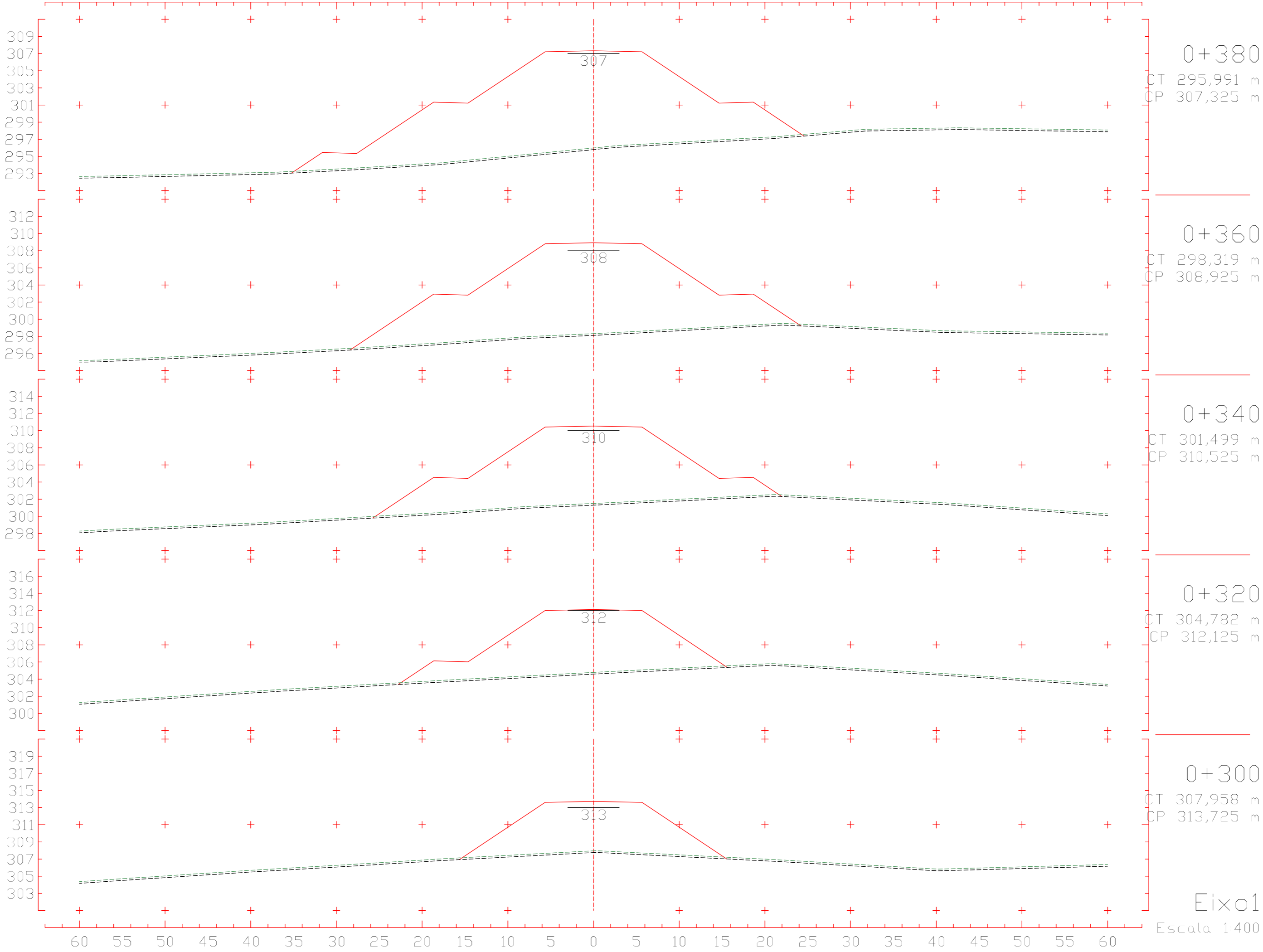
0+140
CT 321,251 m
CP 326,525 m

0+120
CT 324,014 m
CP 328,125 m

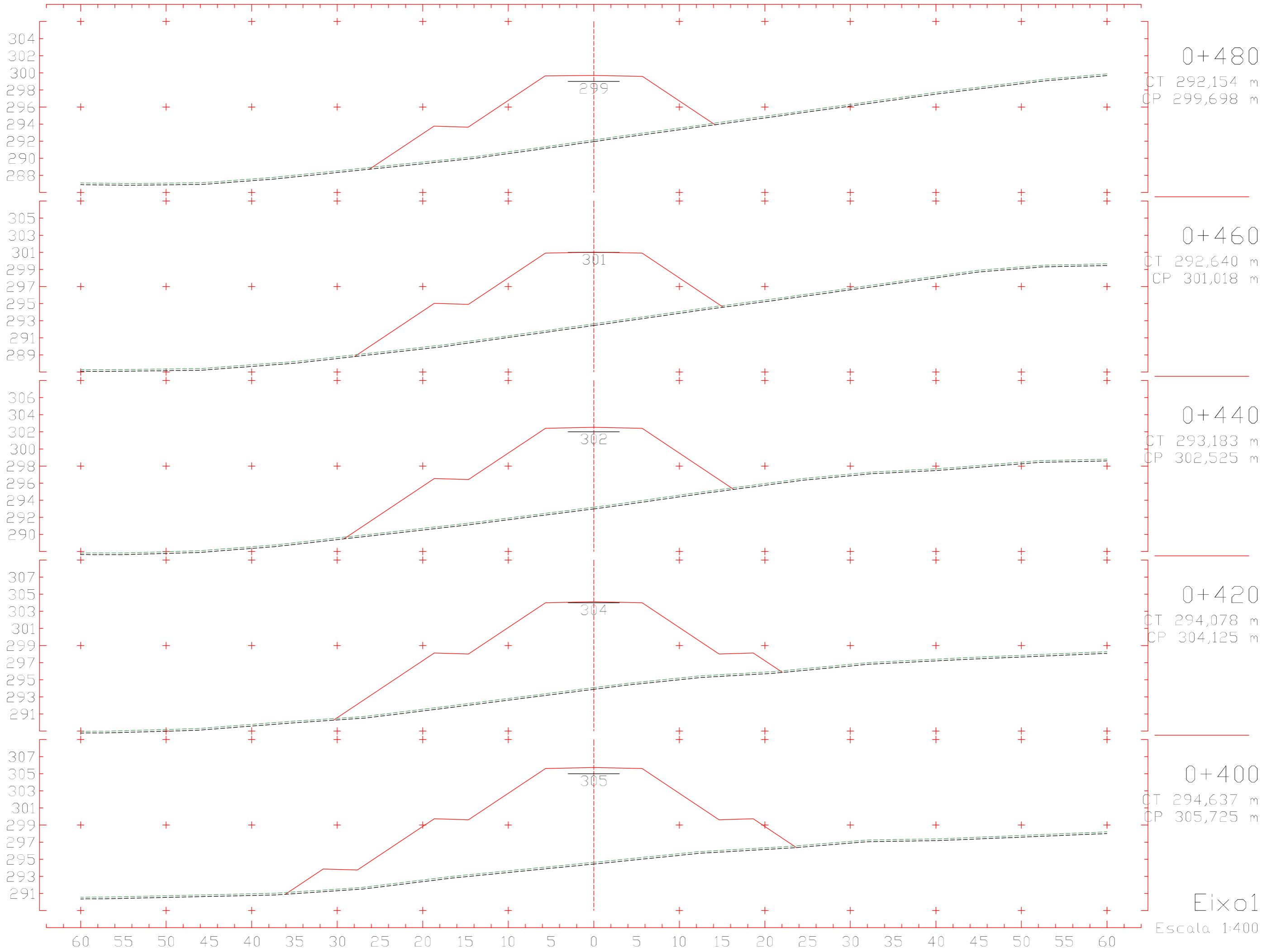
0+100
CT 326,928 m
CP 329,725 m

Eixo 01
Escala 1:400





Eixo 1
Escala 1:400



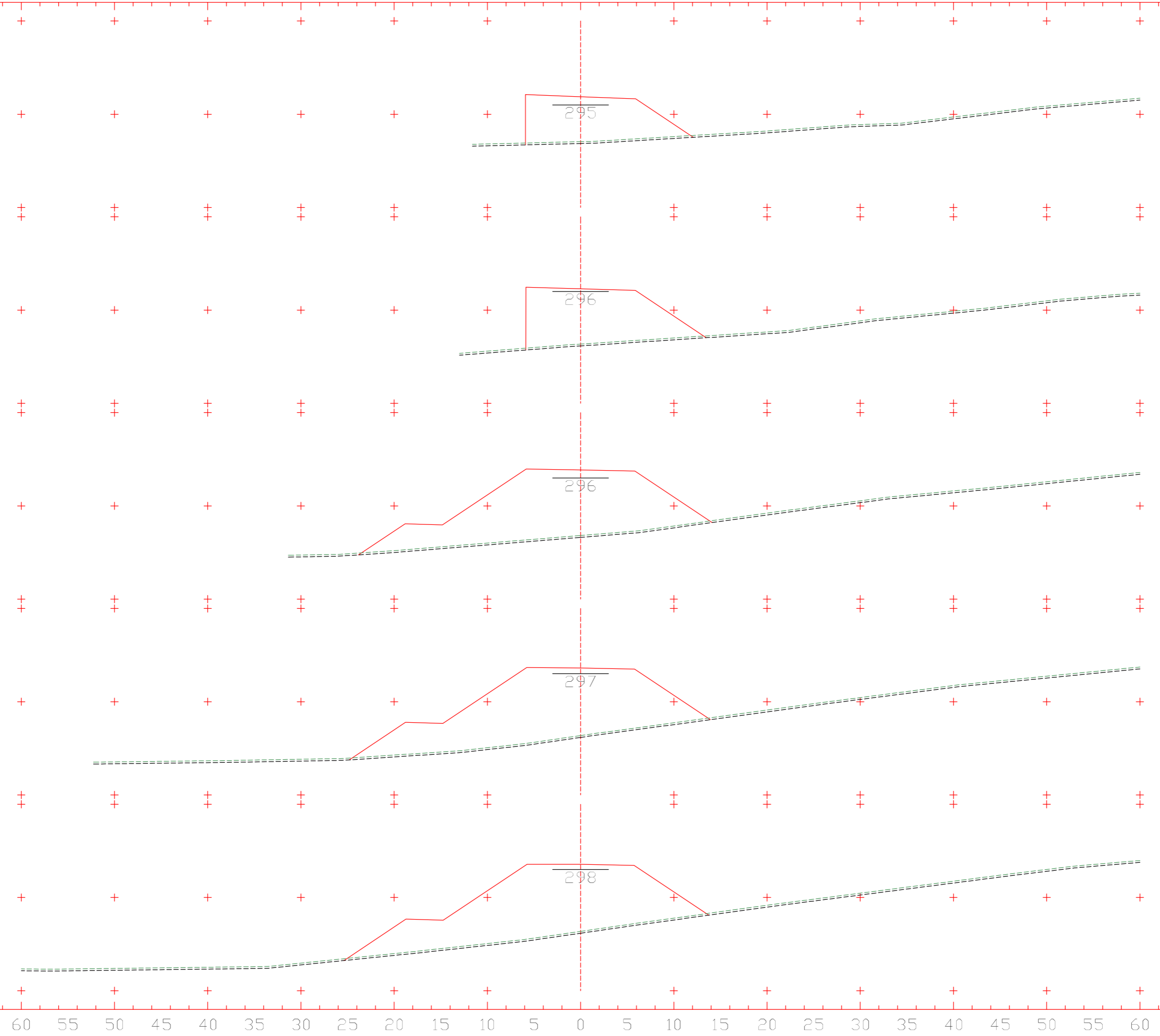
302
300
298
296
294
292
290
288
286

302
300
298
296
294
292
290
288
286

301
299
297
295
293
291
289
287
285

302
300
298
296
294
292
290
288
286

303
301
299
297
295
293
291
289
287



0+580
CT 291,065 m
CP 295,885 m

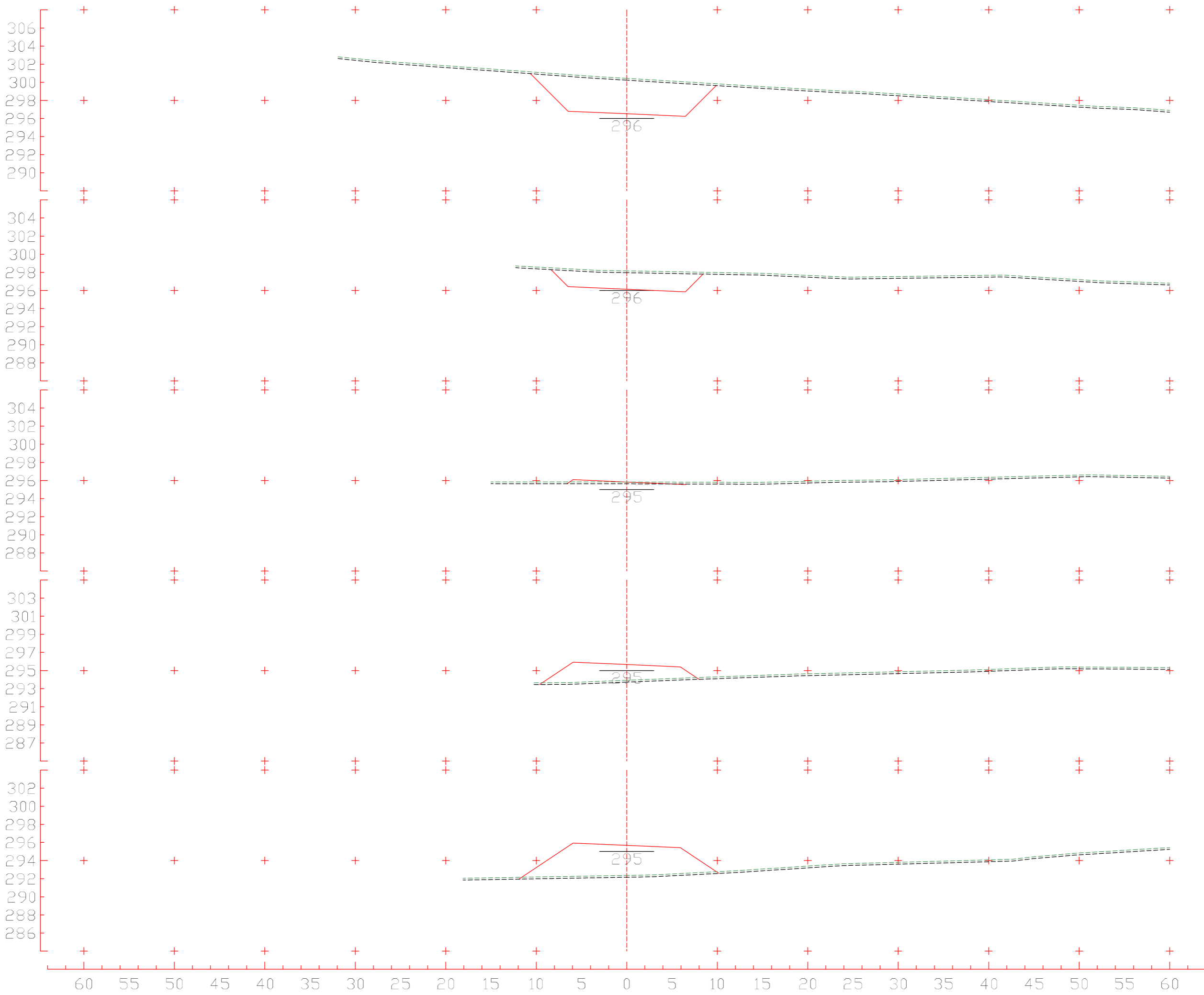
0+560
CT 290,354 m
CP 296,275 m

0+540
CT 289,823 m
CP 296,852 m

0+520
CT 290,370 m
CP 297,614 m

0+500
CT 291,369 m
CP 298,563 m

Eixo 01
Escala 1:400



0+680
 CT 300,429 m
 CP 296,519 m

0+660
 CT 298,159 m
 CP 296,133 m

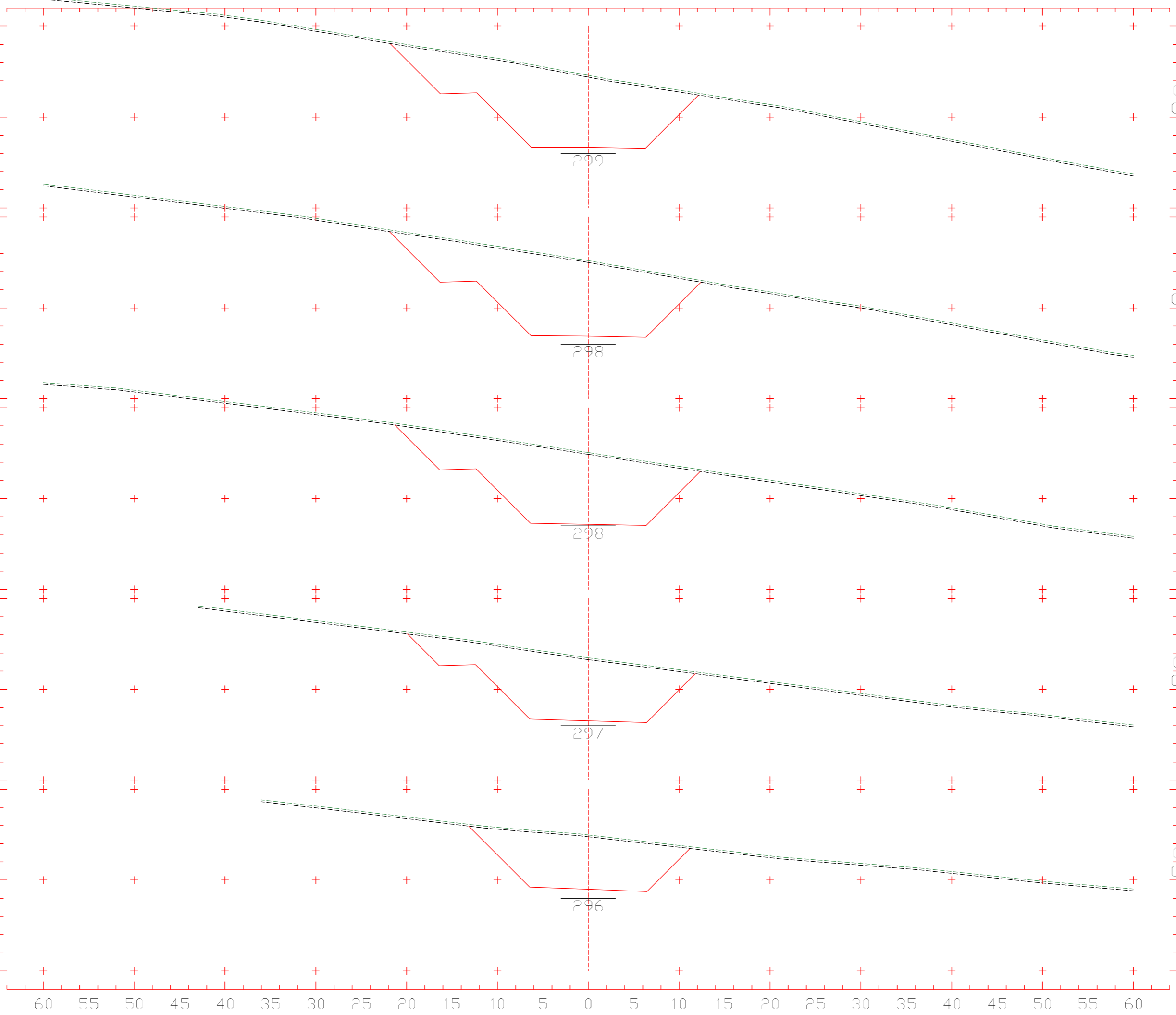
0+640
 CT 295,832 m
 CP 295,831 m

0+620
 CT 293,922 m
 CP 295,663 m

0+600
 CT 292,363 m
 CP 295,681 m

Eixo 1
 Escala 1:400

311
309
307
305
303
301
299
297
295
310
308
306
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302
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296
294
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307
305
303
301
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293
309
307
305
303
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293
306
304
302
300
298
296
294
292
290



0+780
CT 307,597 m
CP 299,685 m

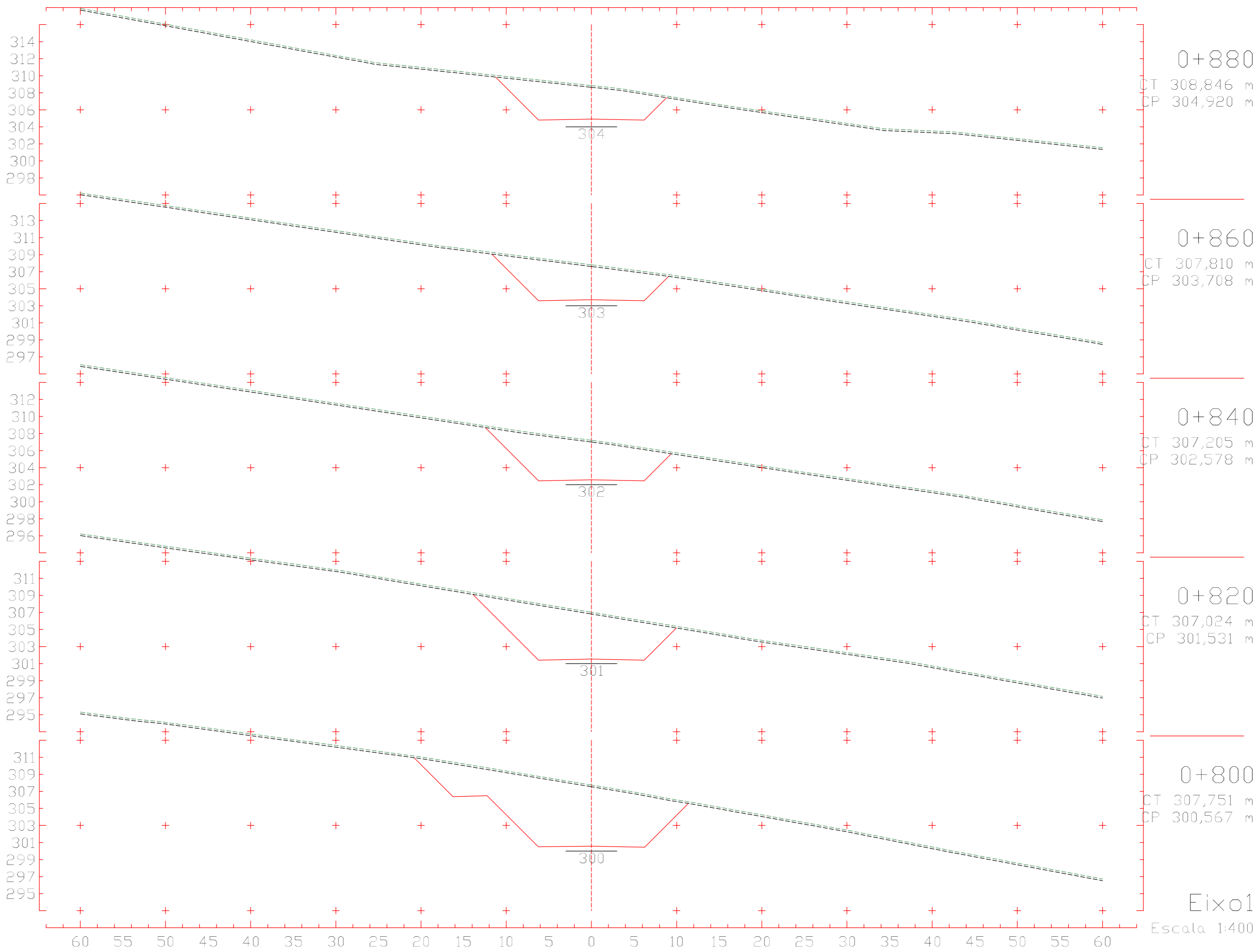
0+760
CT 307,197 m
CP 298,887 m

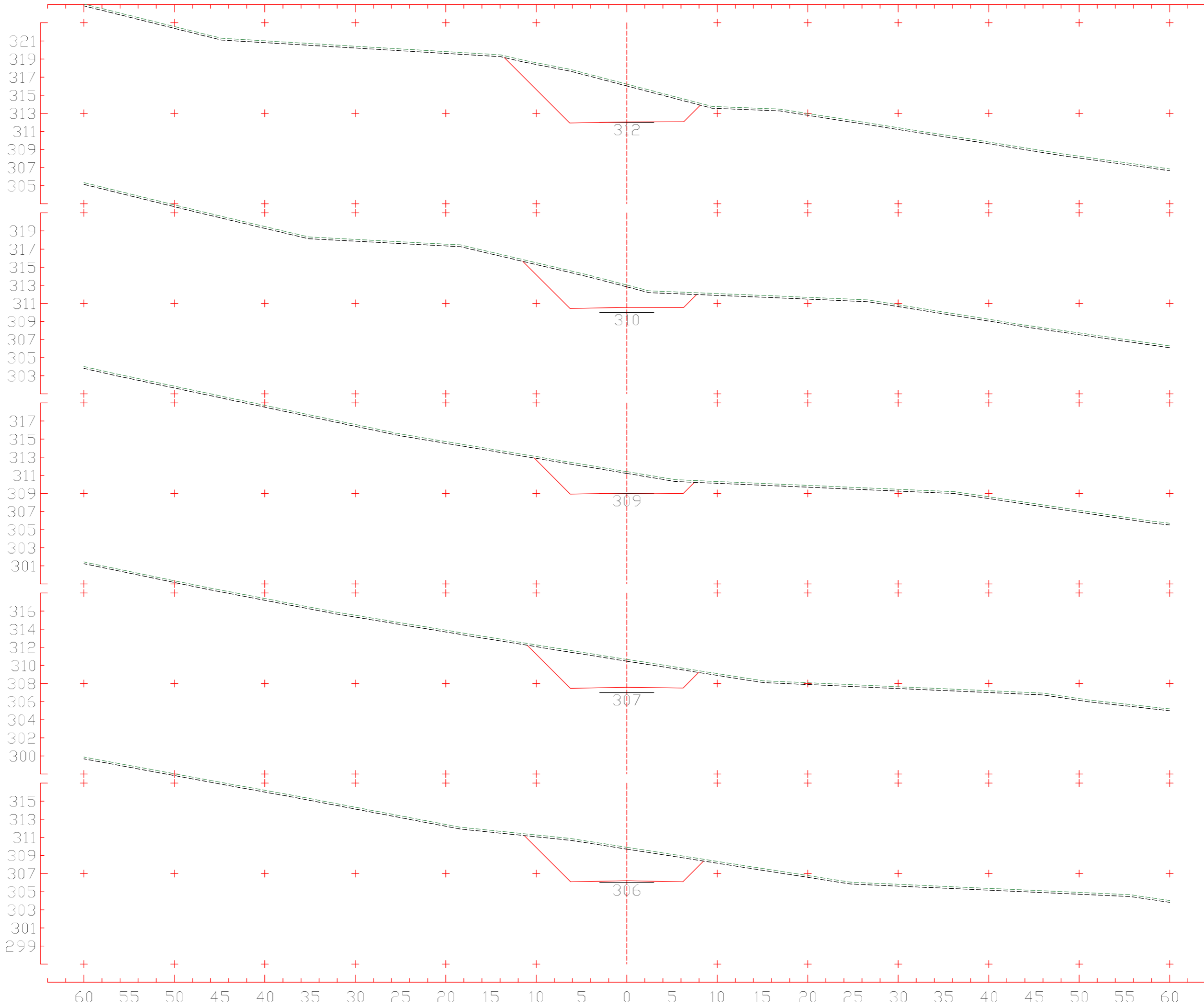
0+740
CT 306,071 m
CP 298,170 m

0+720
CT 304,467 m
CP 297,537 m

0+700
CT 302,972 m
CP 296,987 m

Eixo 1
Escala 1:400





0+980
 CT 316,226 m
 CP 312,057 m

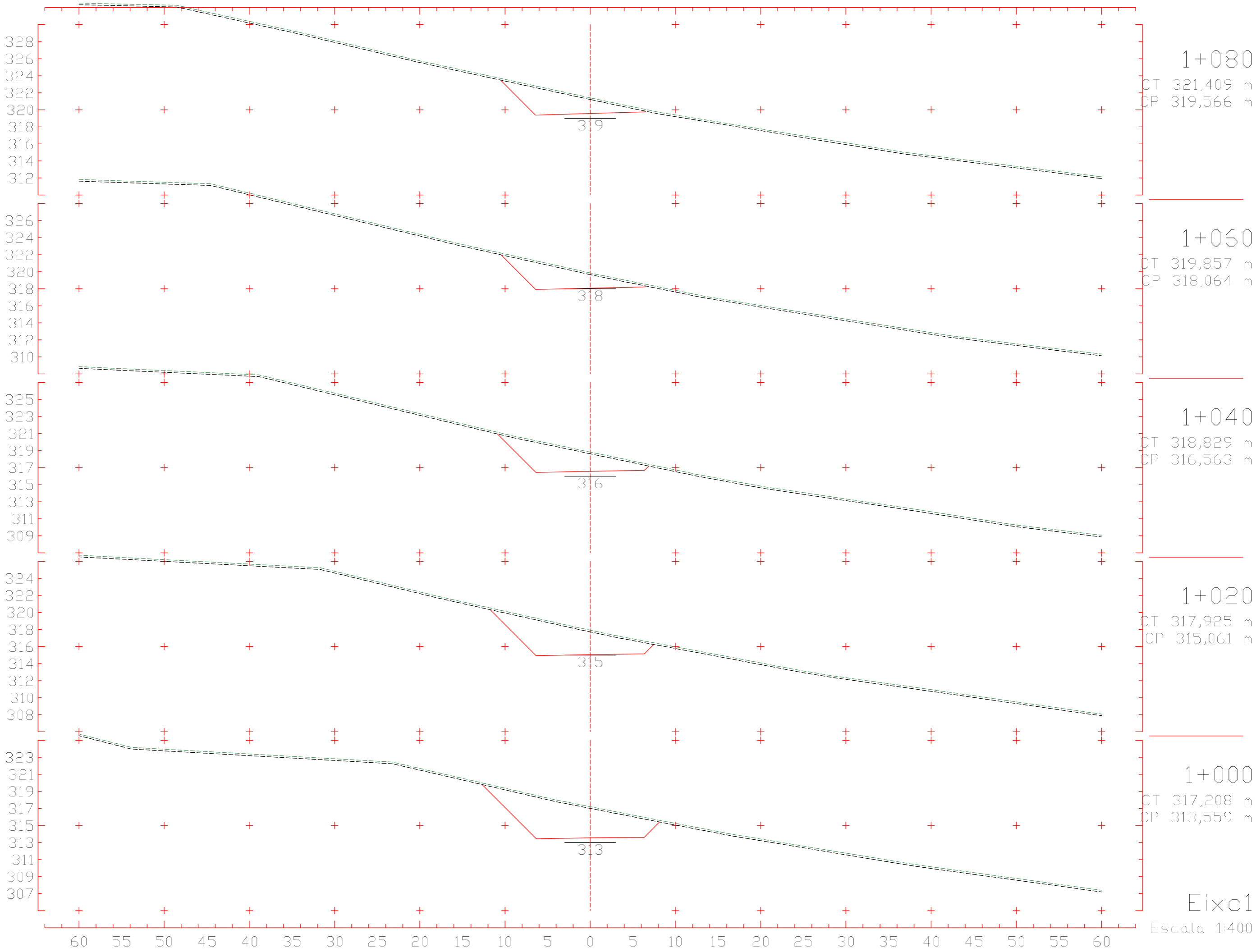
0+960
 CT 313,028 m
 CP 310,555 m

0+940
 CT 311,415 m
 CP 309,053 m

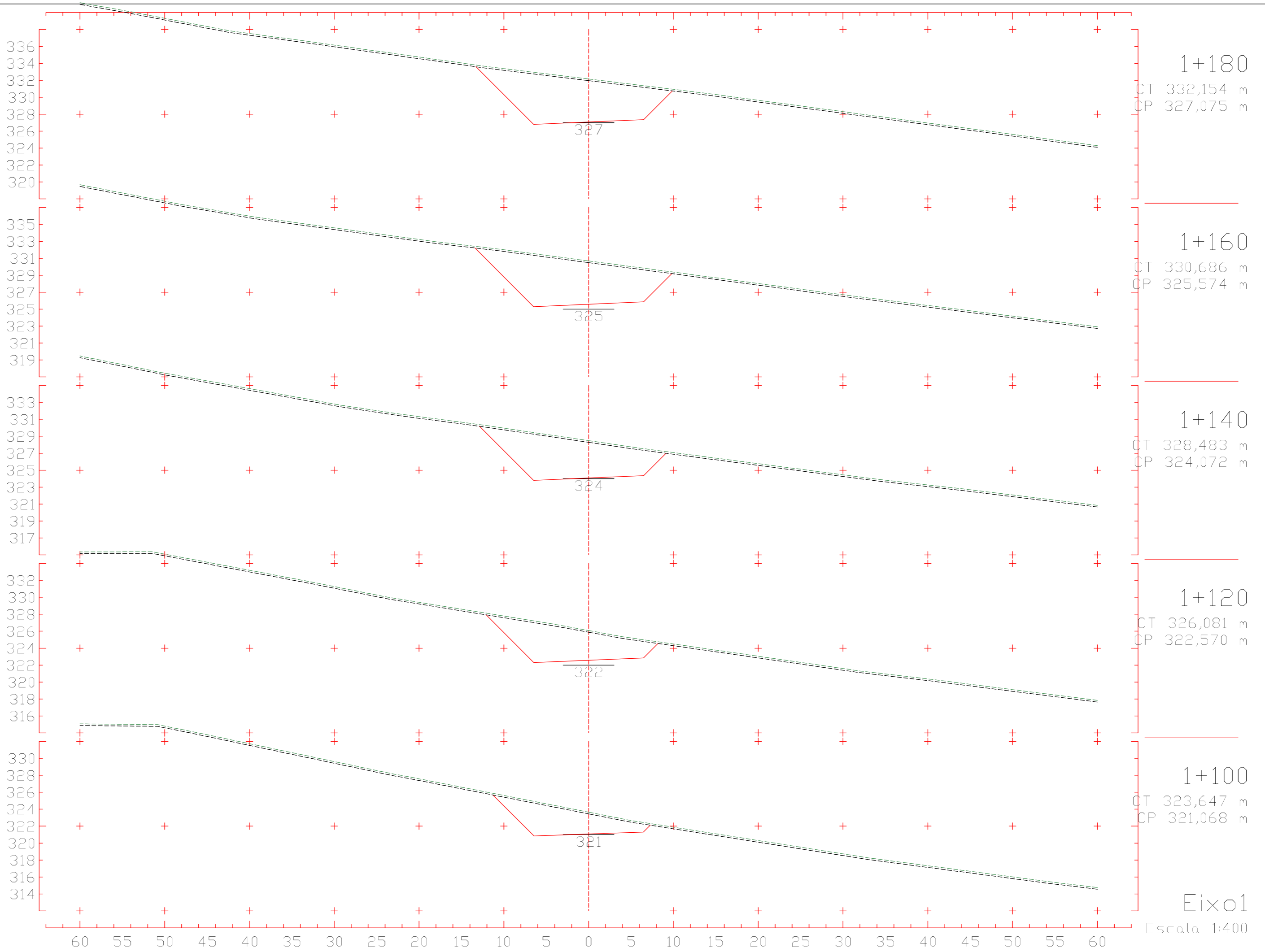
0+920
 CT 310,669 m
 CP 307,593 m

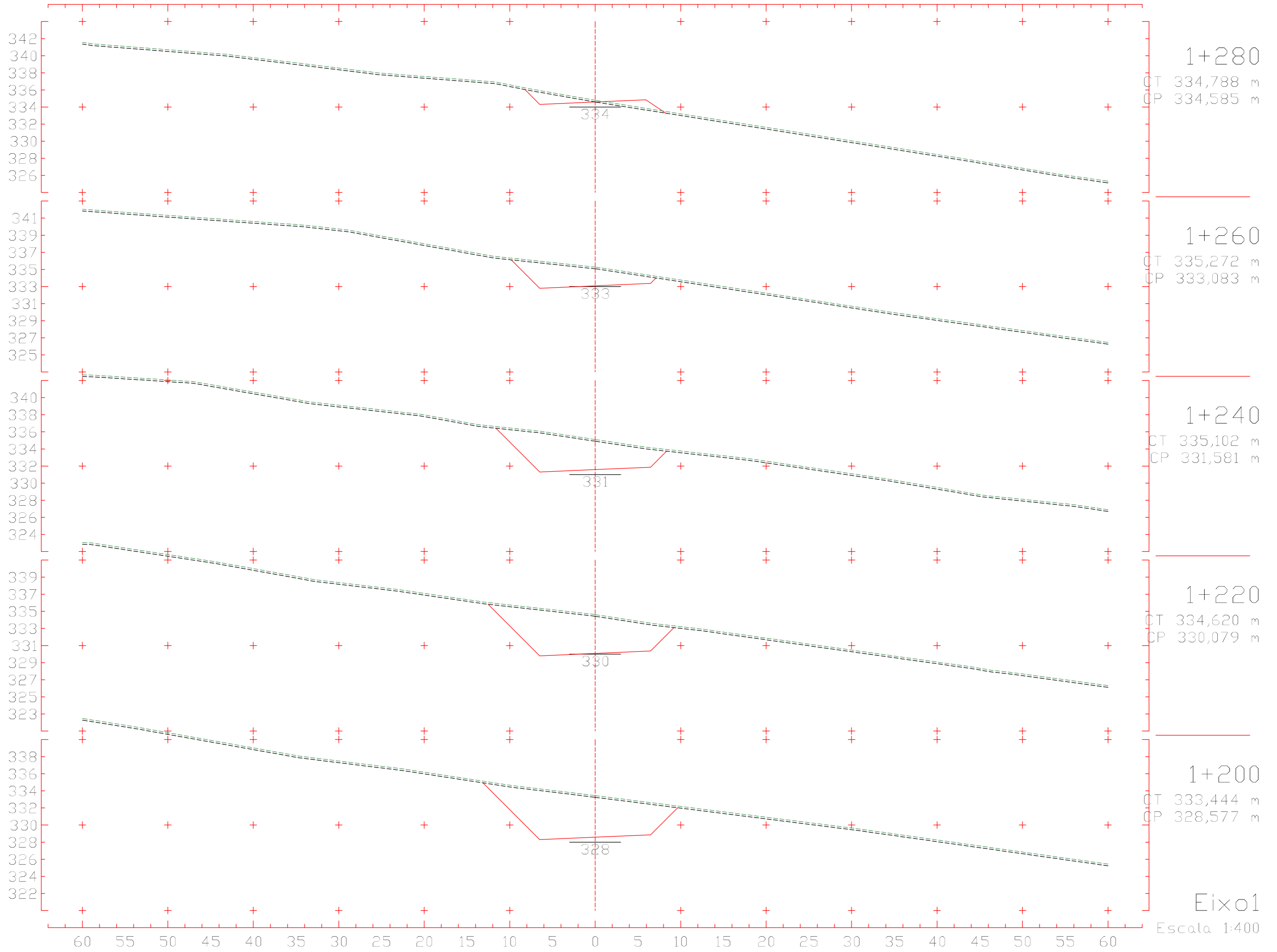
0+900
 CT 309,908 m
 CP 306,215 m

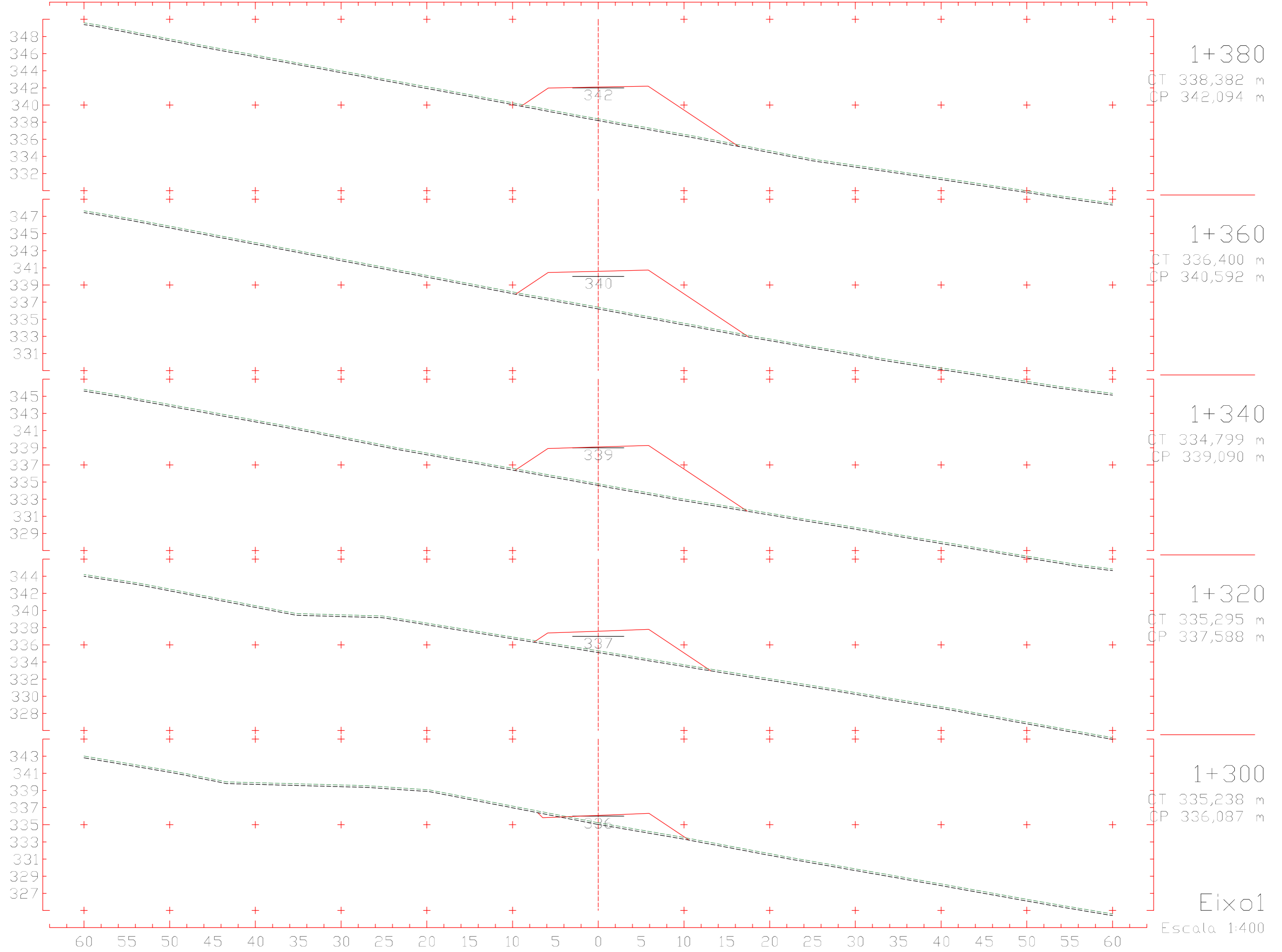
Eixo 01
 Escala 1:400

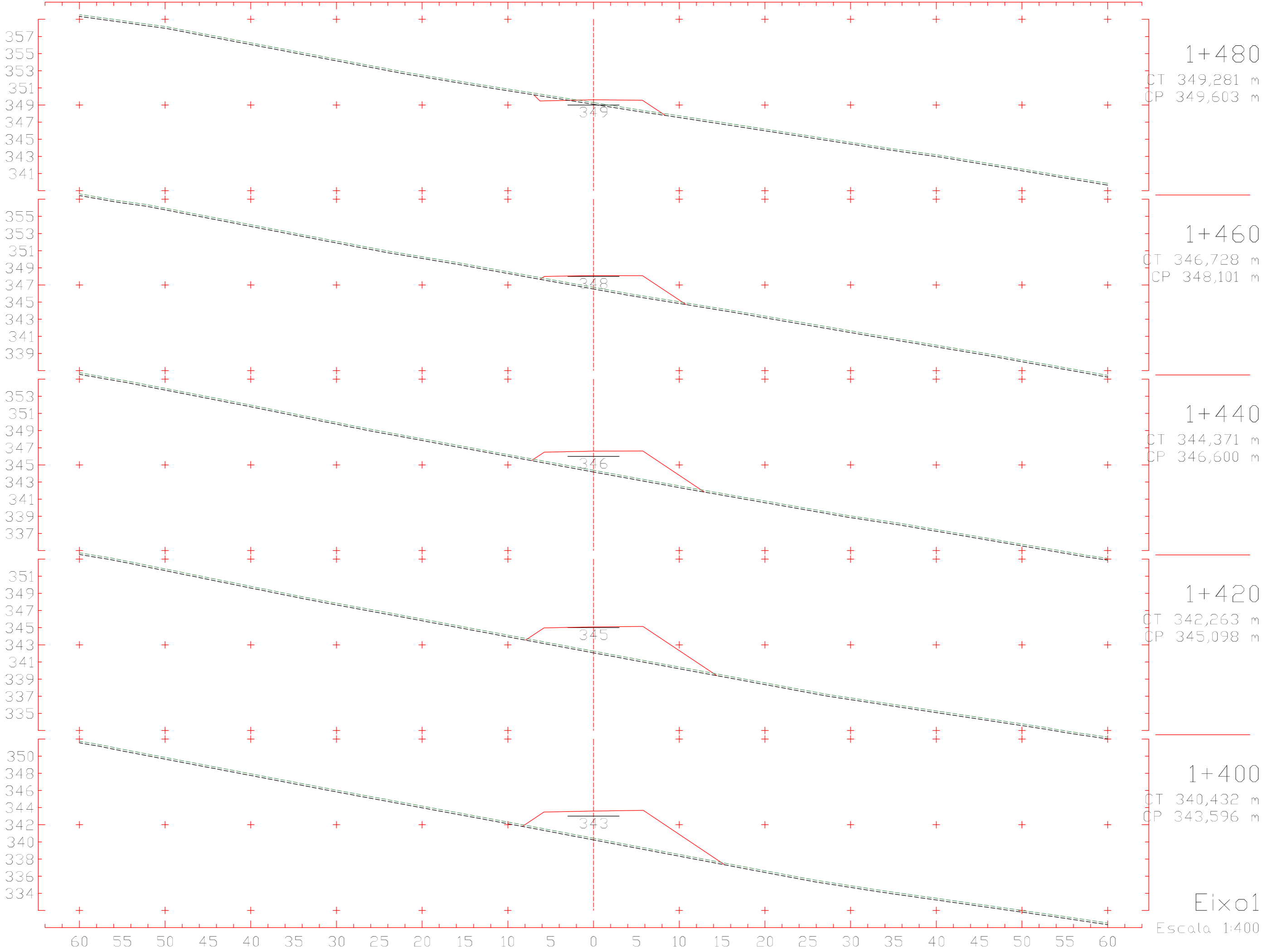


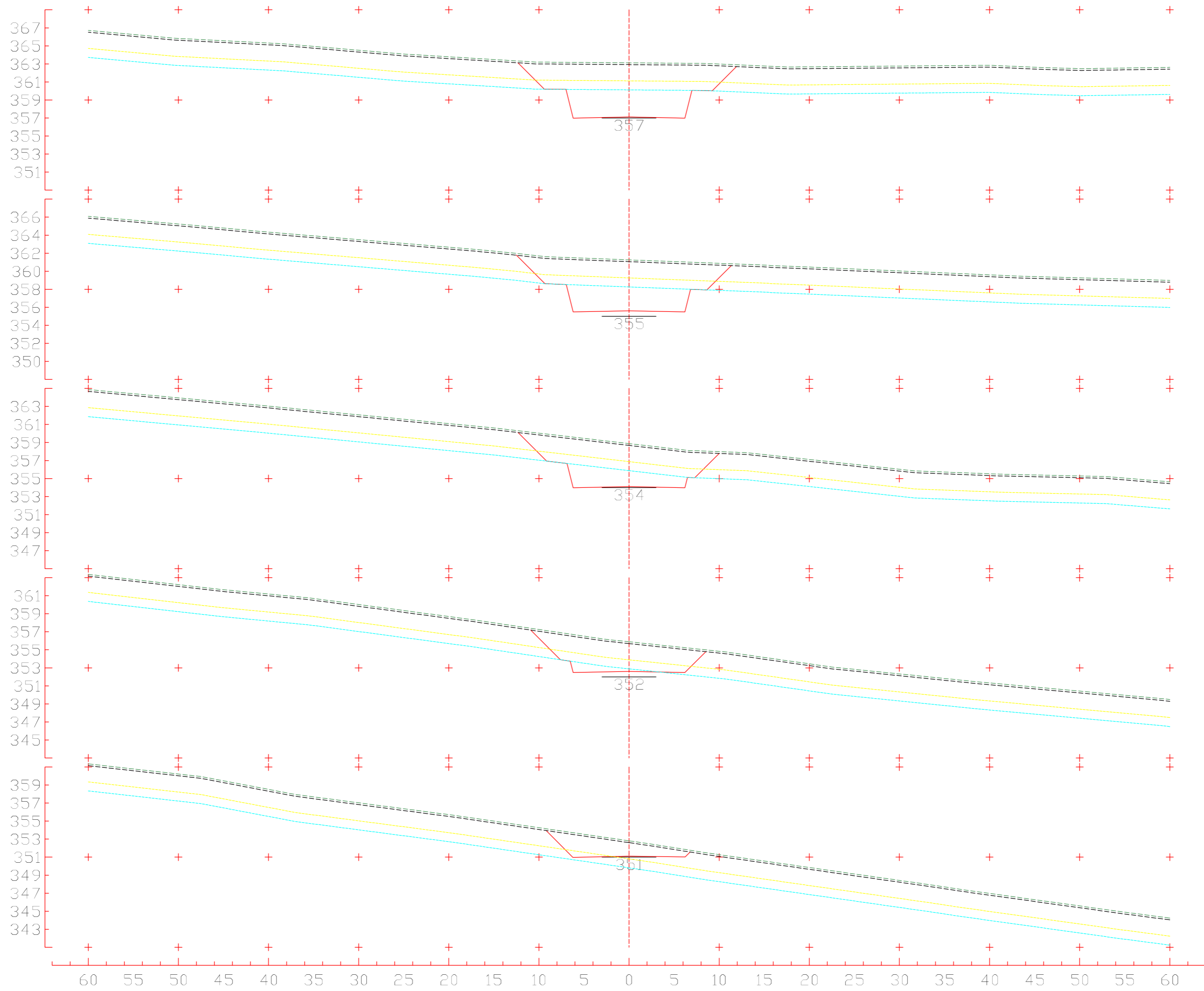
Eixol
Escala 1:400











1+580
 CT 363,120 m
 CP 357,113 m

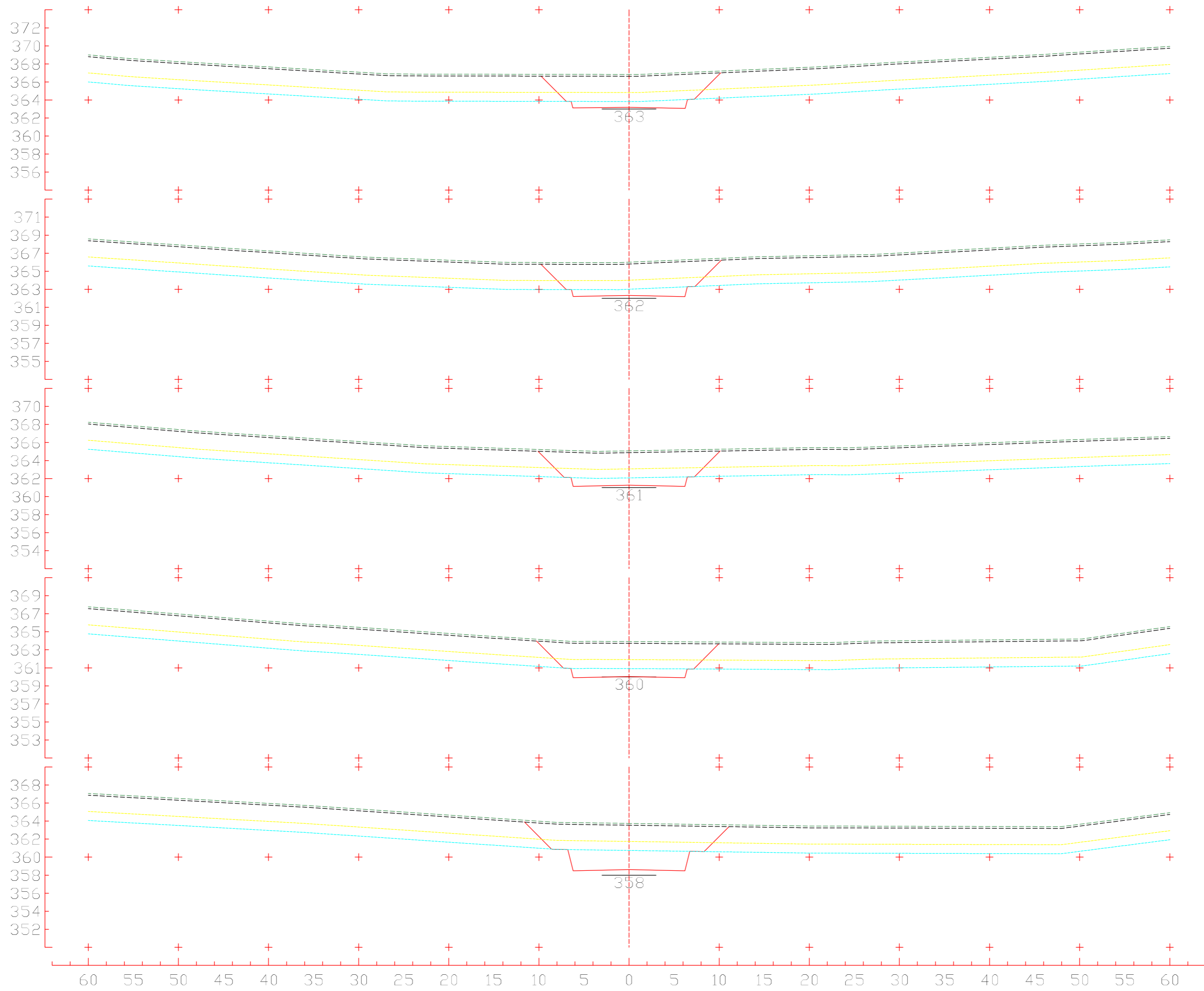
1+560
 CT 361,259 m
 CP 355,611 m

1+540
 CT 358,878 m
 CP 354,109 m

1+520
 CT 355,891 m
 CP 352,607 m

1+500
 CT 352,810 m
 CP 351,105 m

Eixo 01
 Escala 1:400



1+680
CT 366,830 m
CP 363,191 m

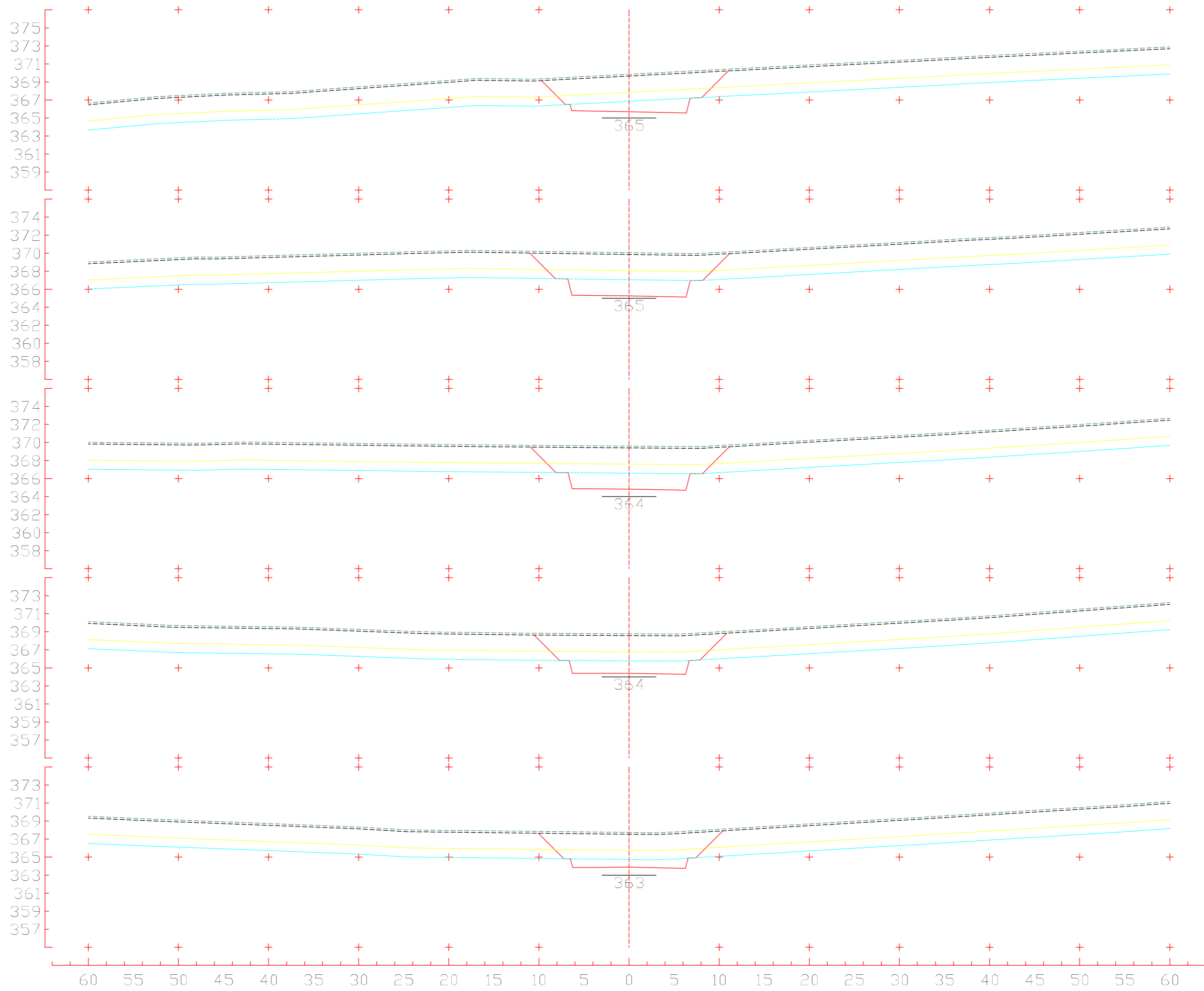
1+660
CT 366,003 m
CP 362,315 m

1+640
CT 365,073 m
CP 361,260 m

1+620
CT 363,916 m
CP 360,027 m

1+600
CT 363,741 m
CP 358,614 m

Eixo 01
Escala 1:400



1+780
 CT 369,853 m
 CP 365,691 m

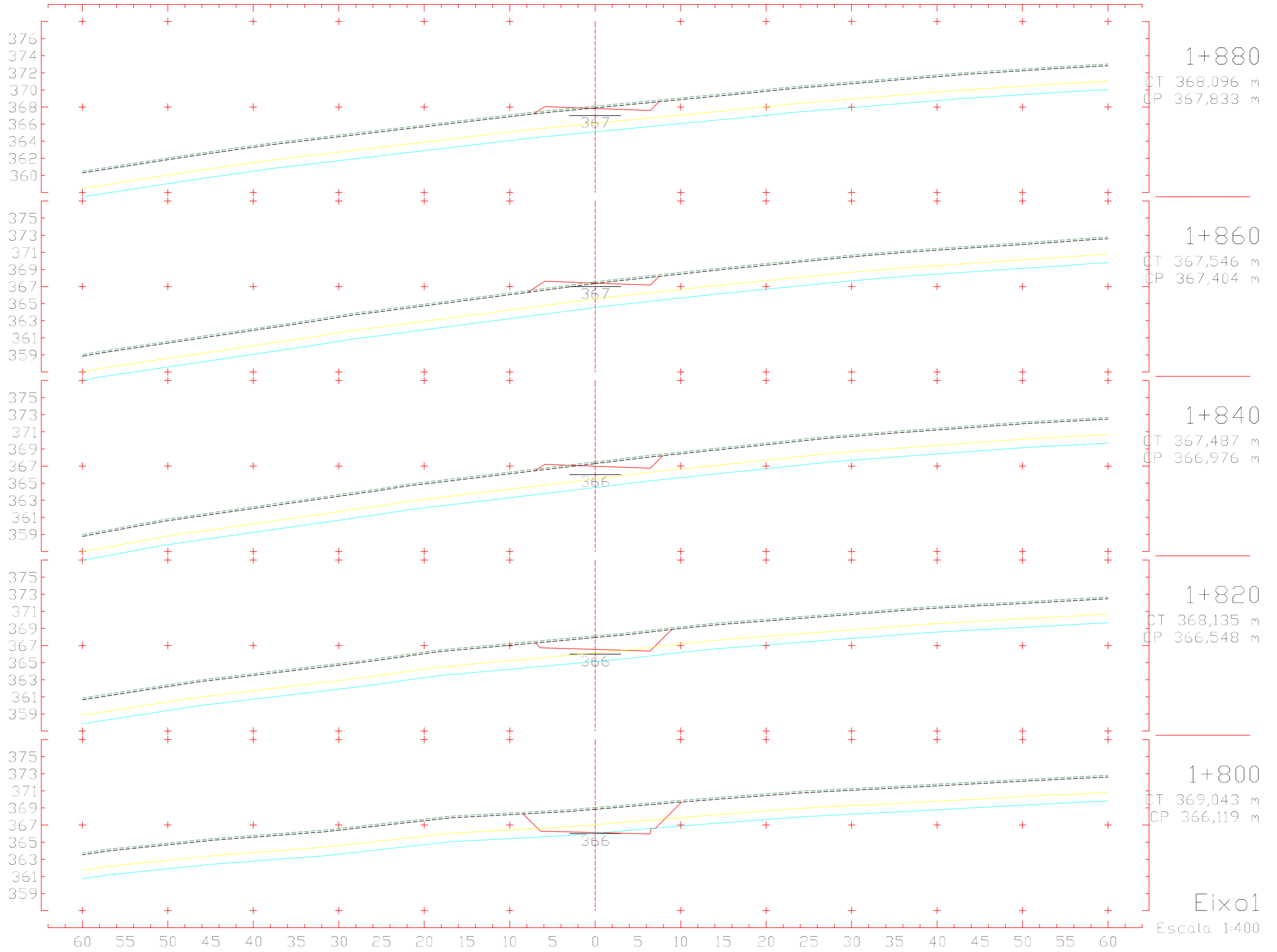
1+760
 CT 370,059 m
 CP 365,262 m

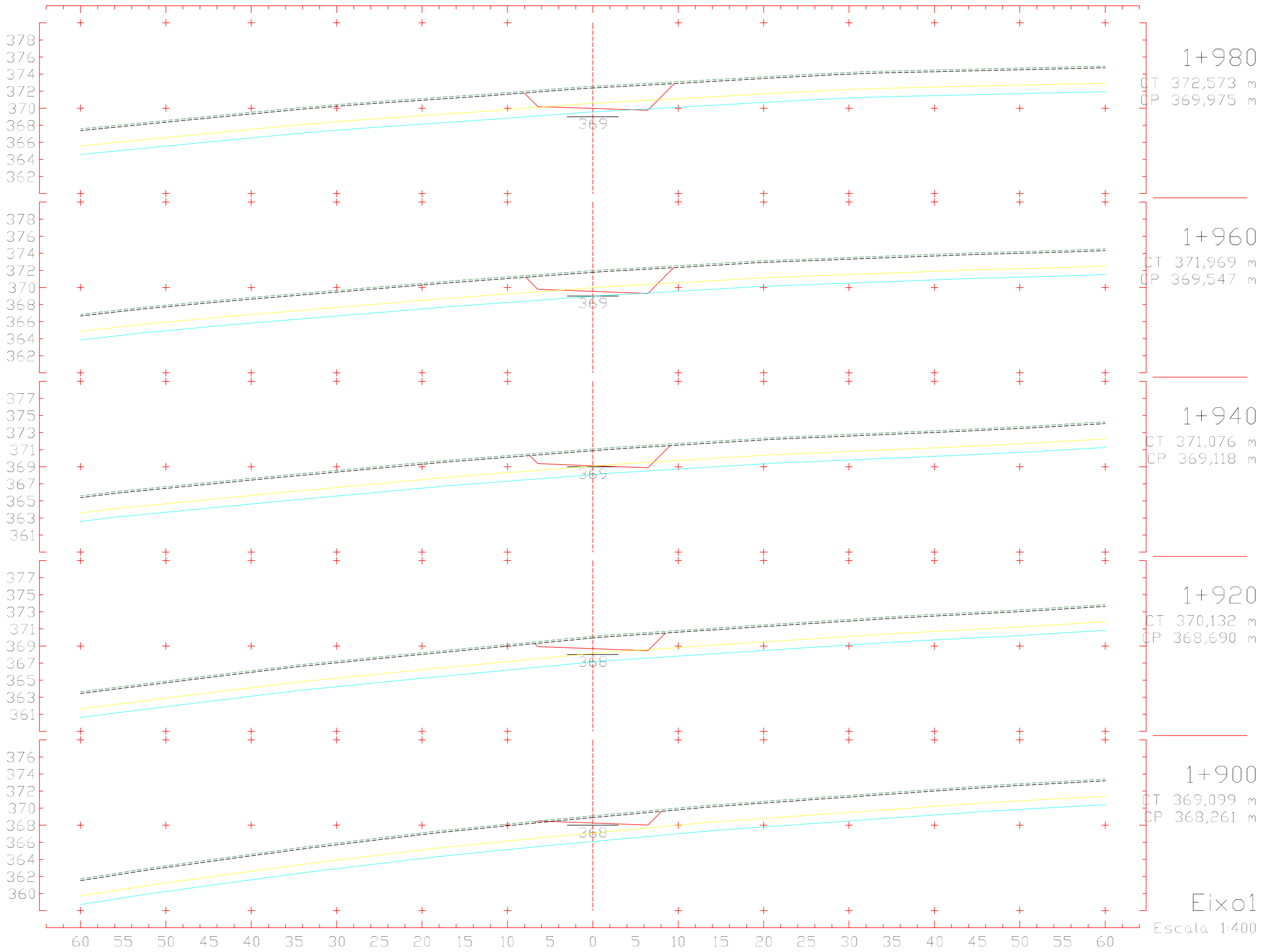
1+740
 CT 369,600 m
 CP 364,834 m

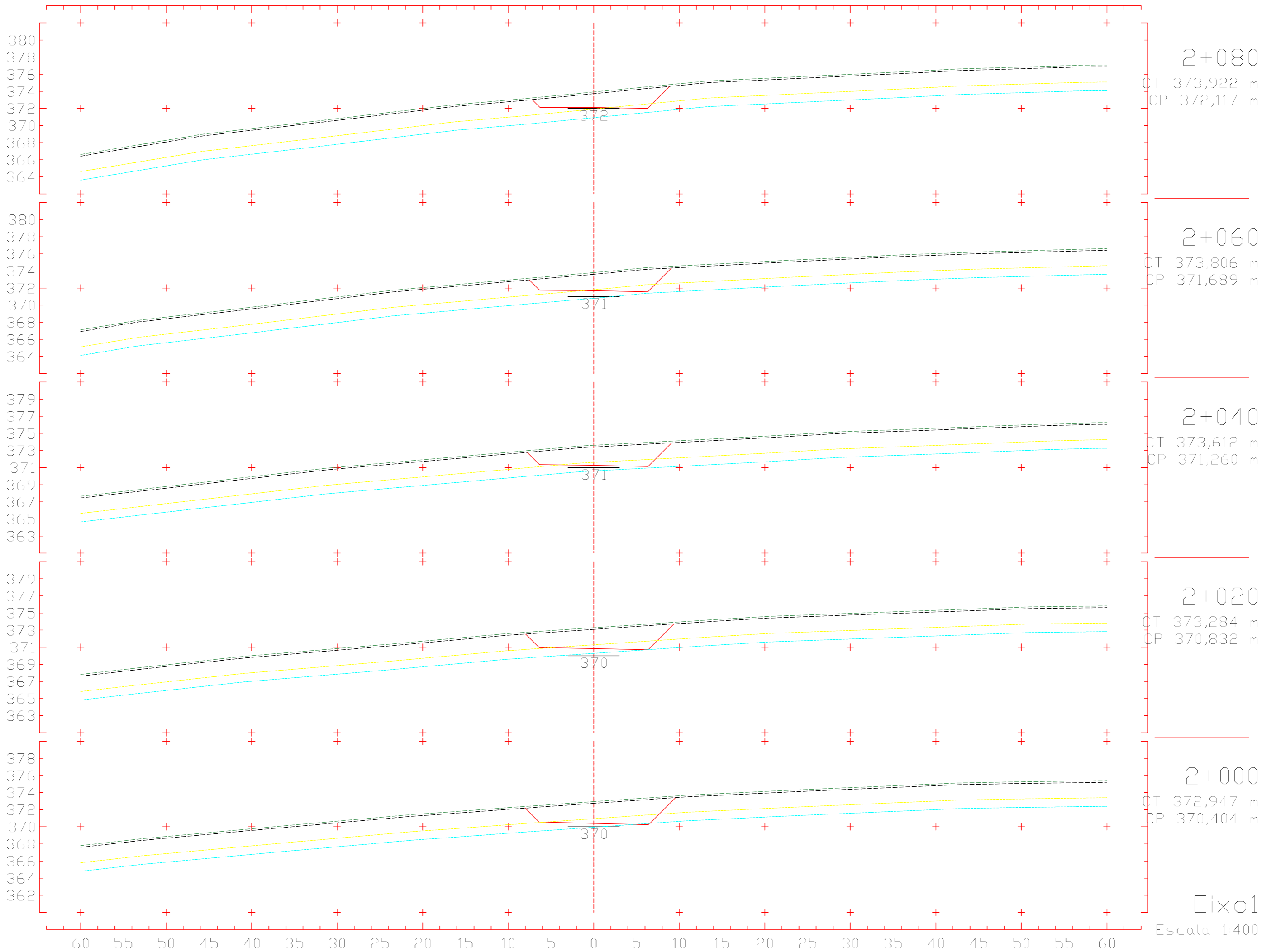
1+720
 CT 368,778 m
 CP 364,405 m

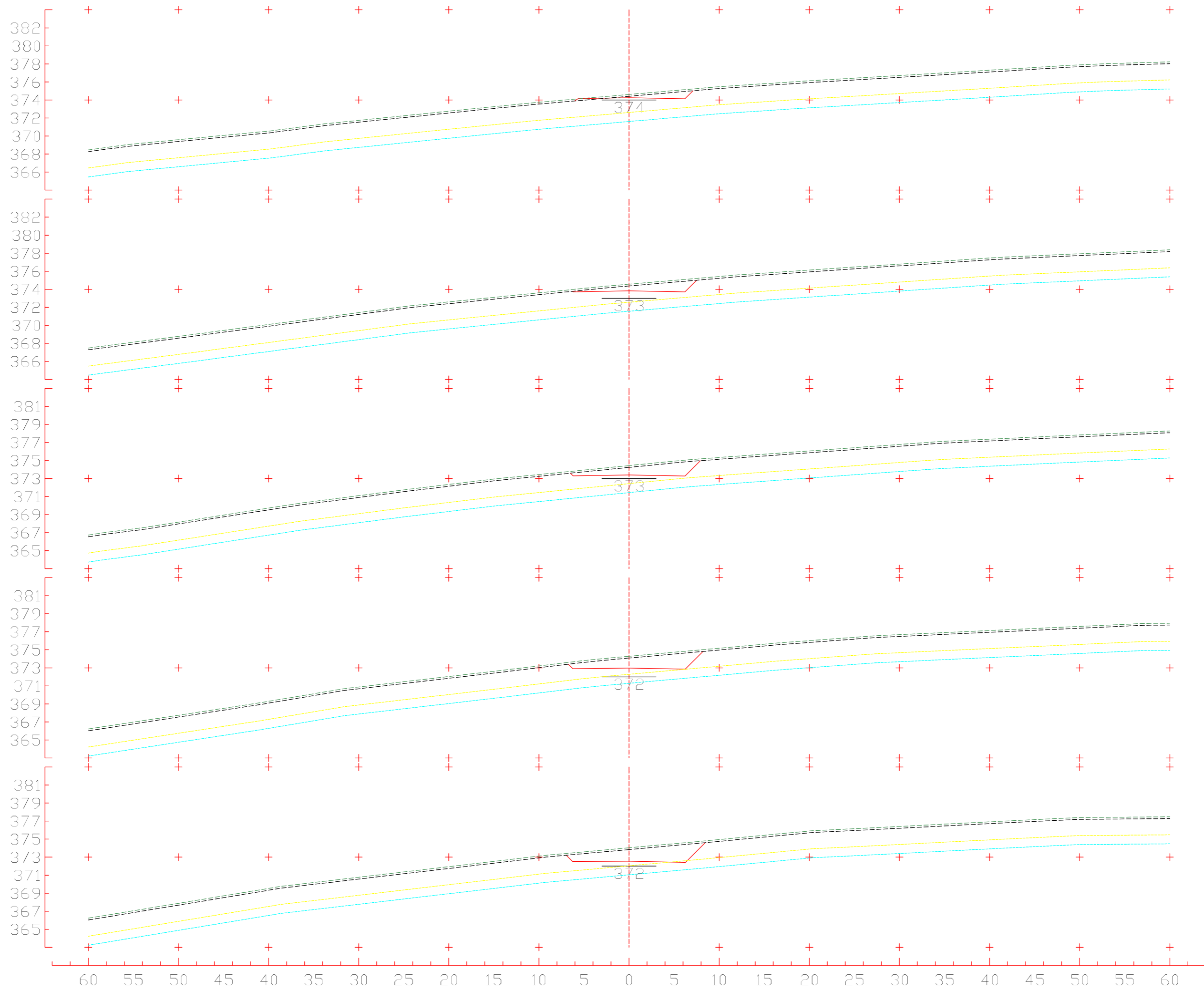
1+700
 CT 367,740 m
 CP 363,887 m

Eixo 01
 Escala 1:400









2+180
 CT 374,610 m
 CP 374,260 m

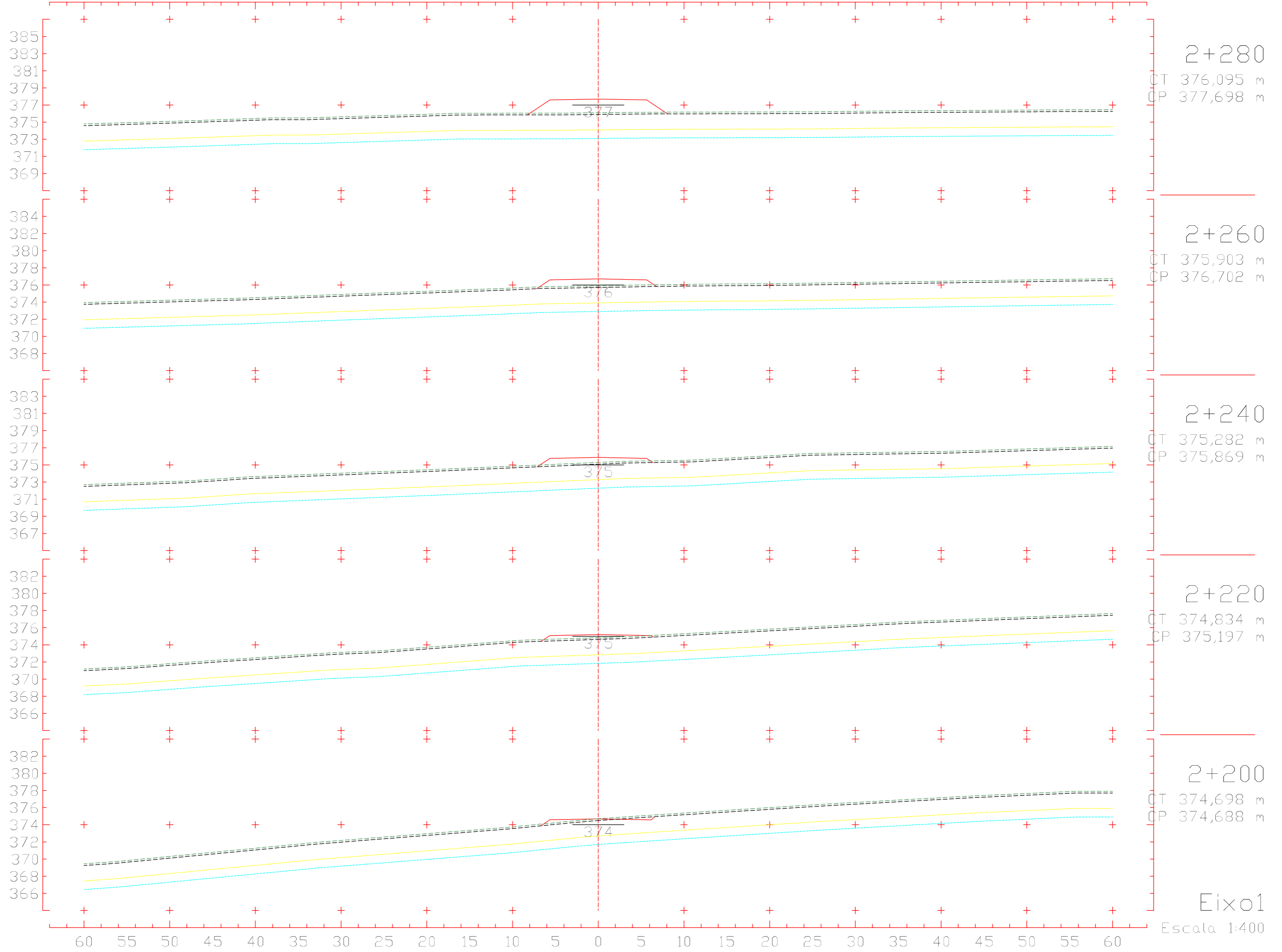
2+160
 CT 374,564 m
 CP 373,831 m

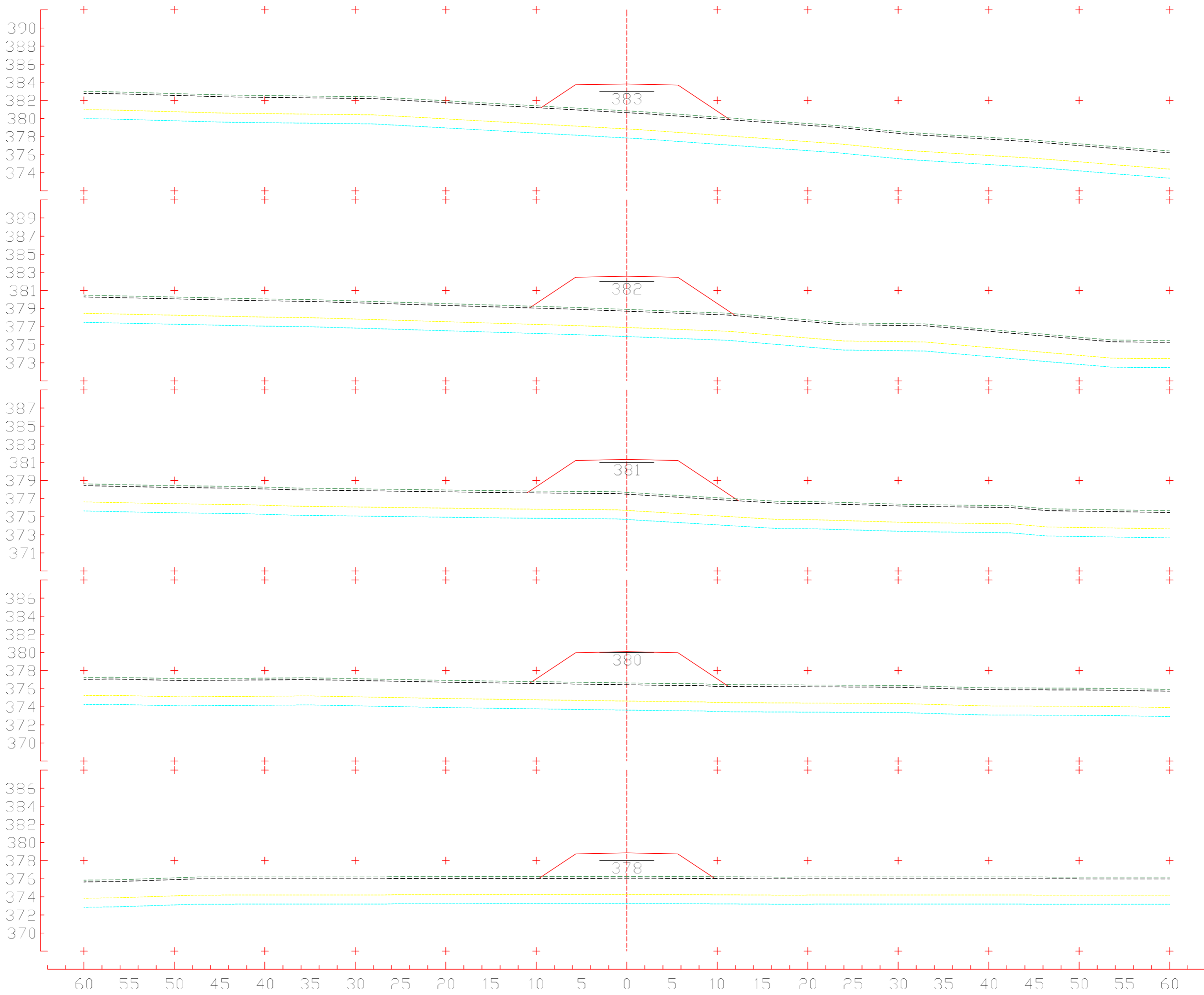
2+140
 CT 374,440 m
 CP 373,403 m

2+120
 CT 374,286 m
 CP 372,974 m

2+100
 CT 374,040 m
 CP 372,546 m

Eixo 01
 Escala 1:400





2+380
 CT 380,842 m
 CP 383,808 m

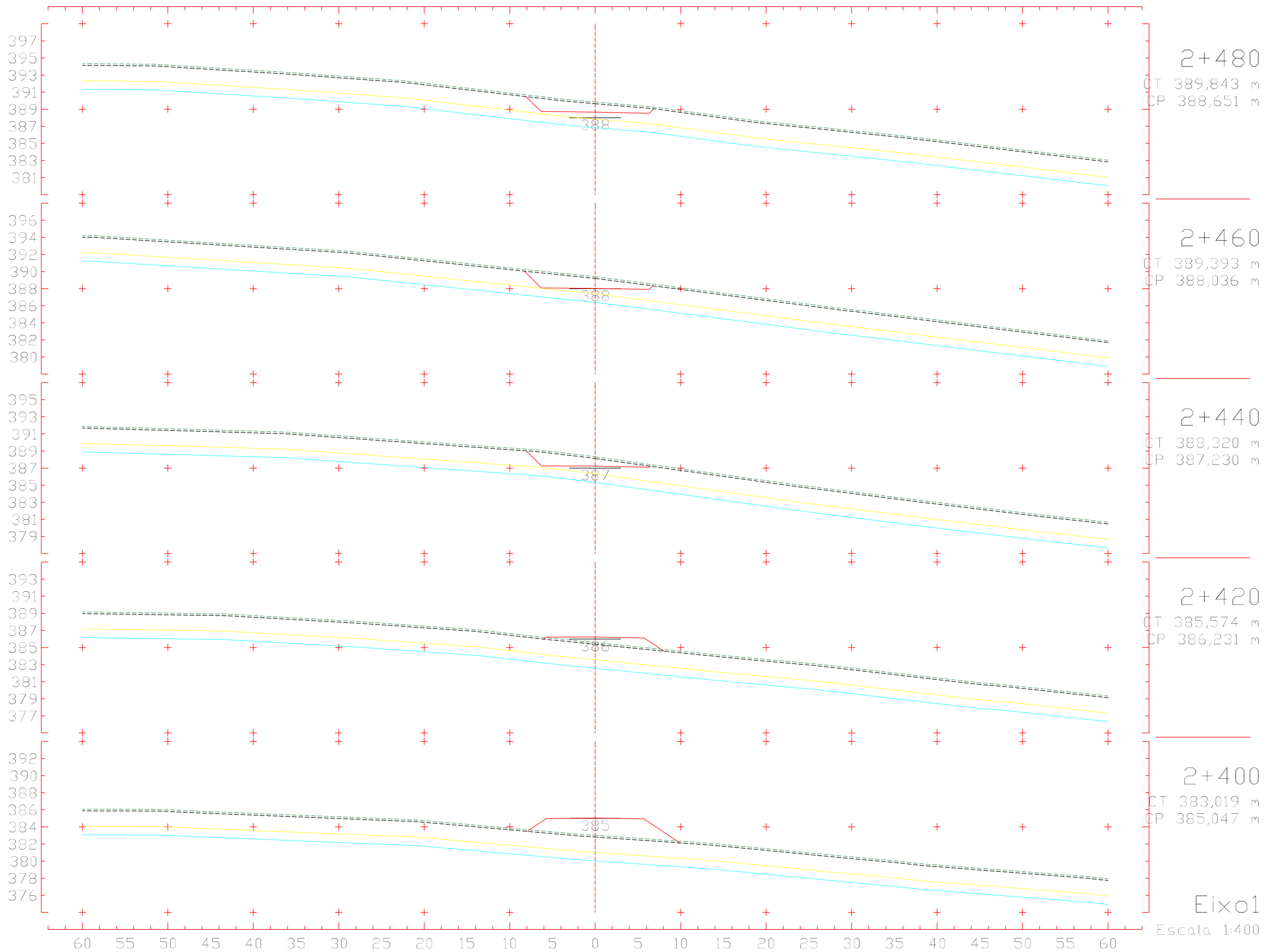
2+360
 CT 378,905 m
 CP 382,570 m

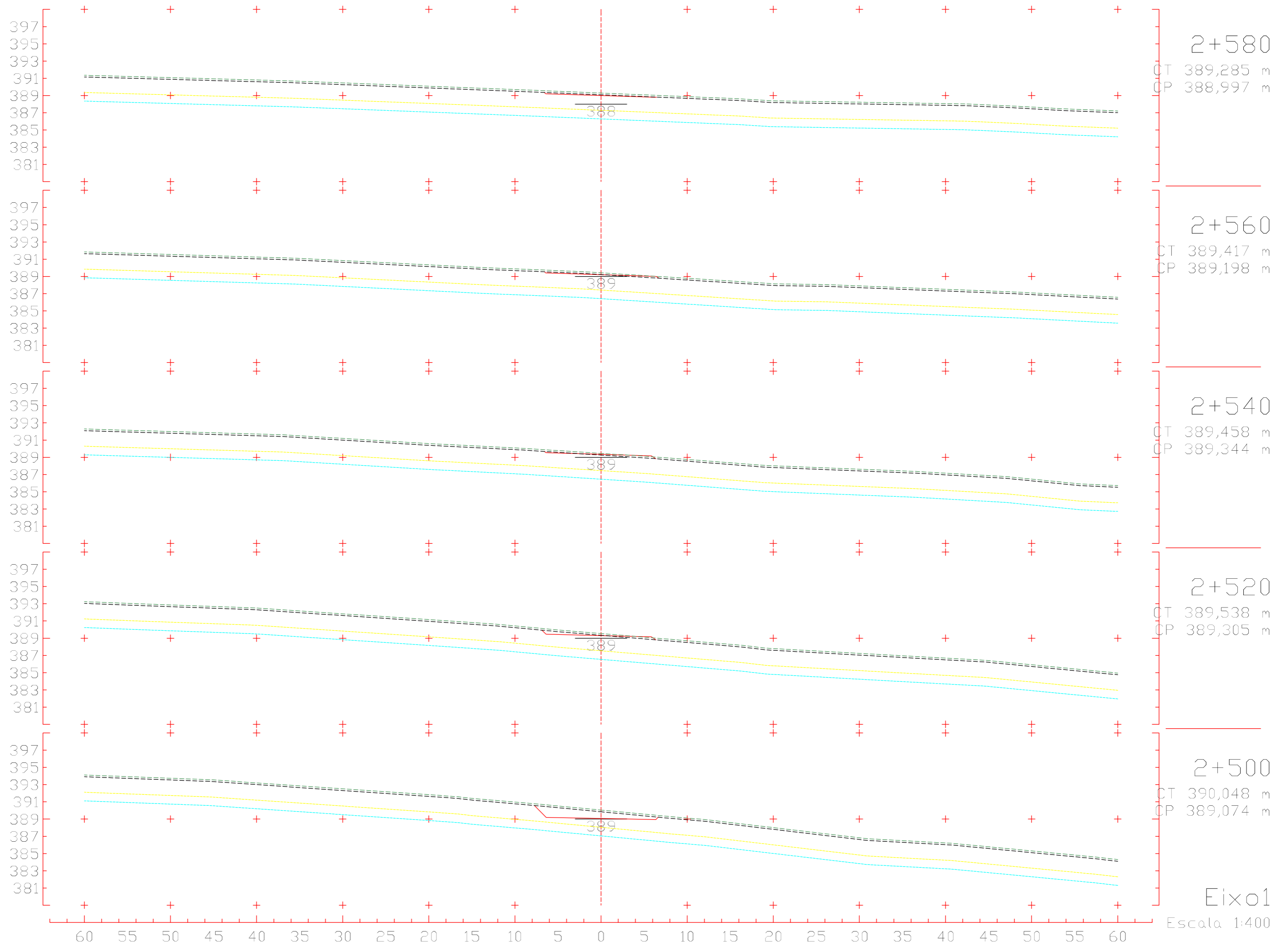
2+340
 CT 377,691 m
 CP 381,332 m

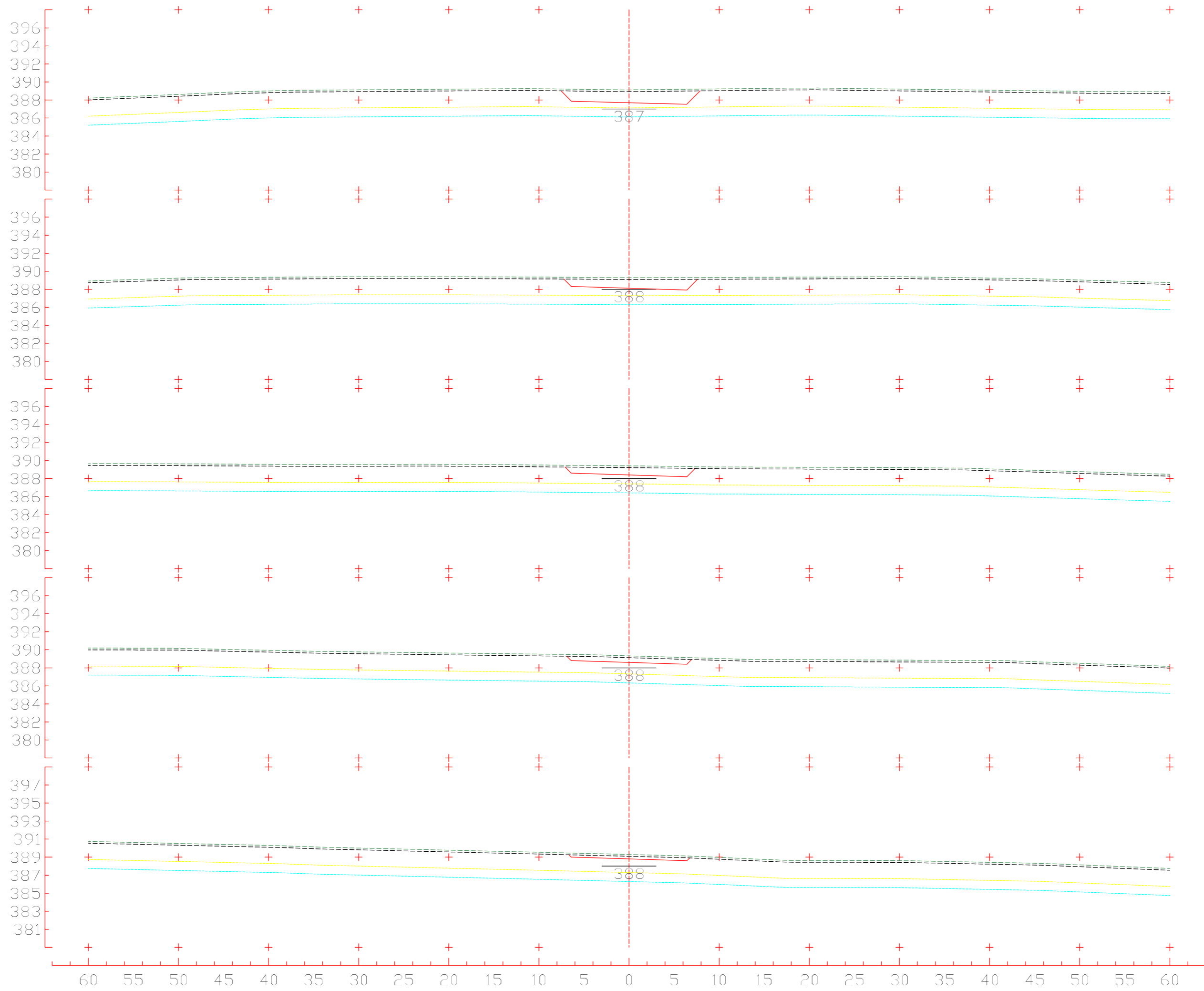
2+320
 CT 376,630 m
 CP 380,093 m

2+300
 CT 376,253 m
 CP 378,855 m

Eixo 1
 Escala 1:400







2+680
CT 389,121 m
CP 387,696 m

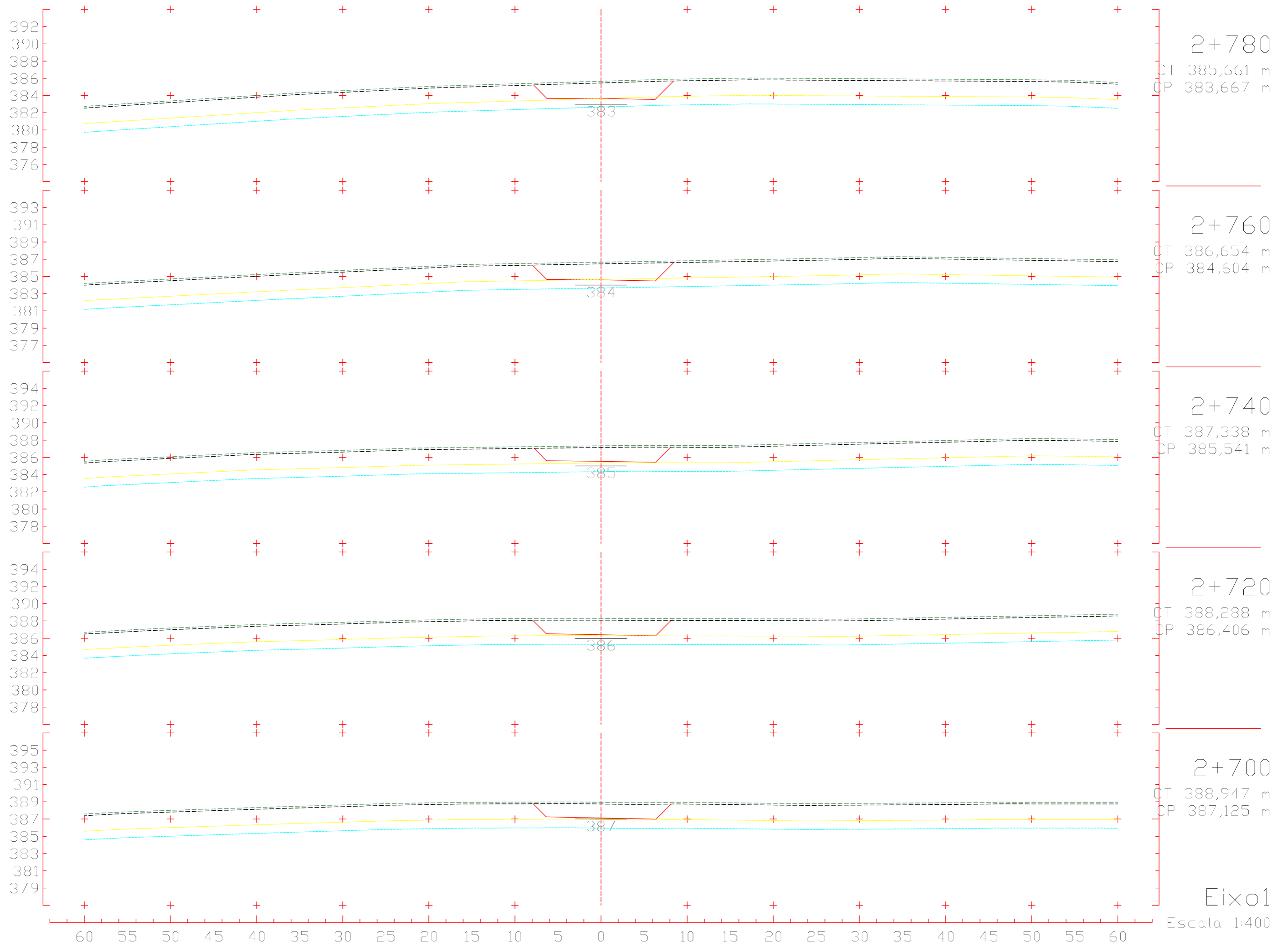
2+660
CT 389,282 m
CP 388,119 m

2+640
CT 389,409 m
CP 388,396 m

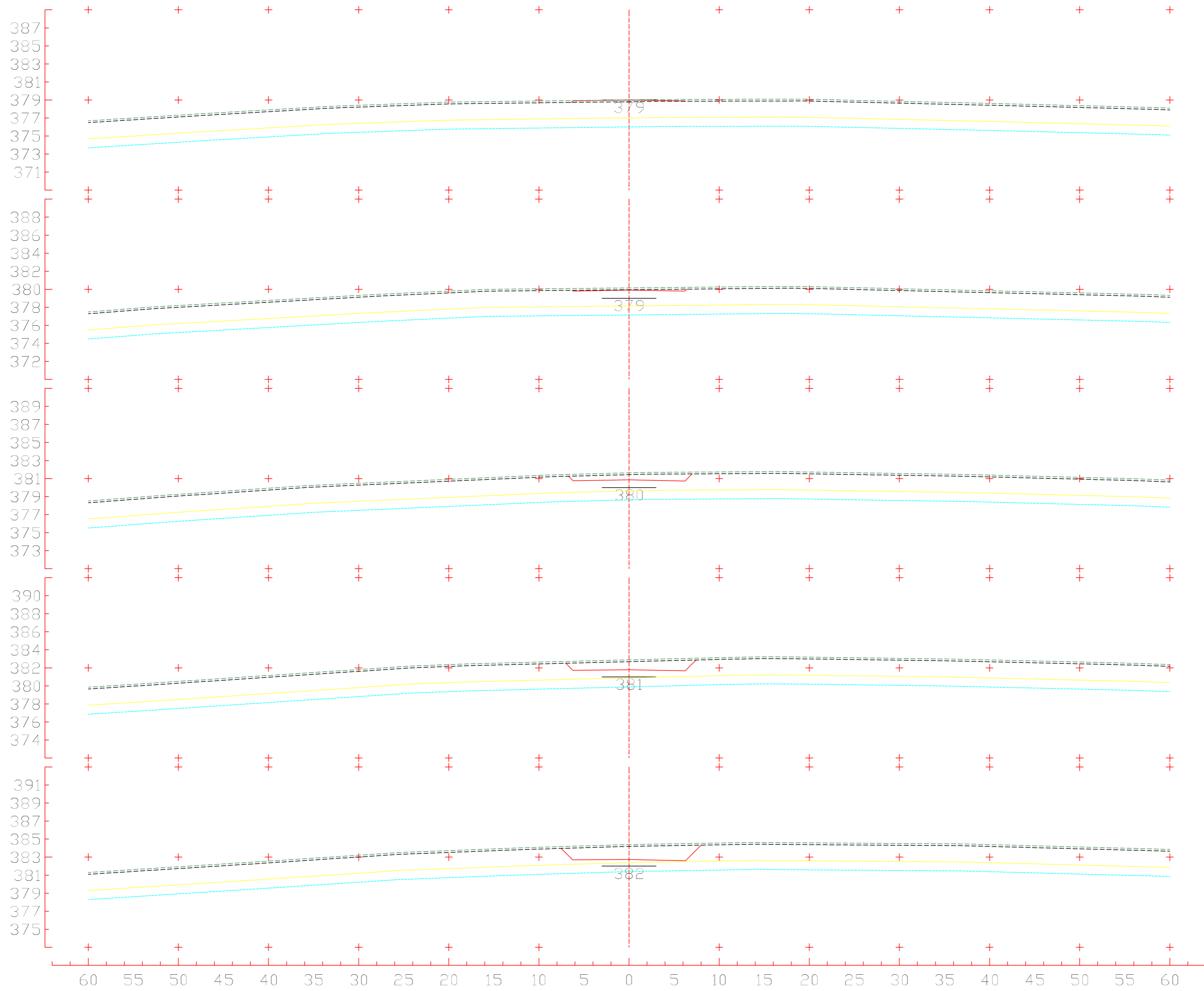
2+620
CT 389,330 m
CP 388,596 m

2+600
CT 389,293 m
CP 388,797 m

Eixo 01
Escala 1:400



Escala 1:400



2+880
 CT 379,009 m
 CP 379,022 m

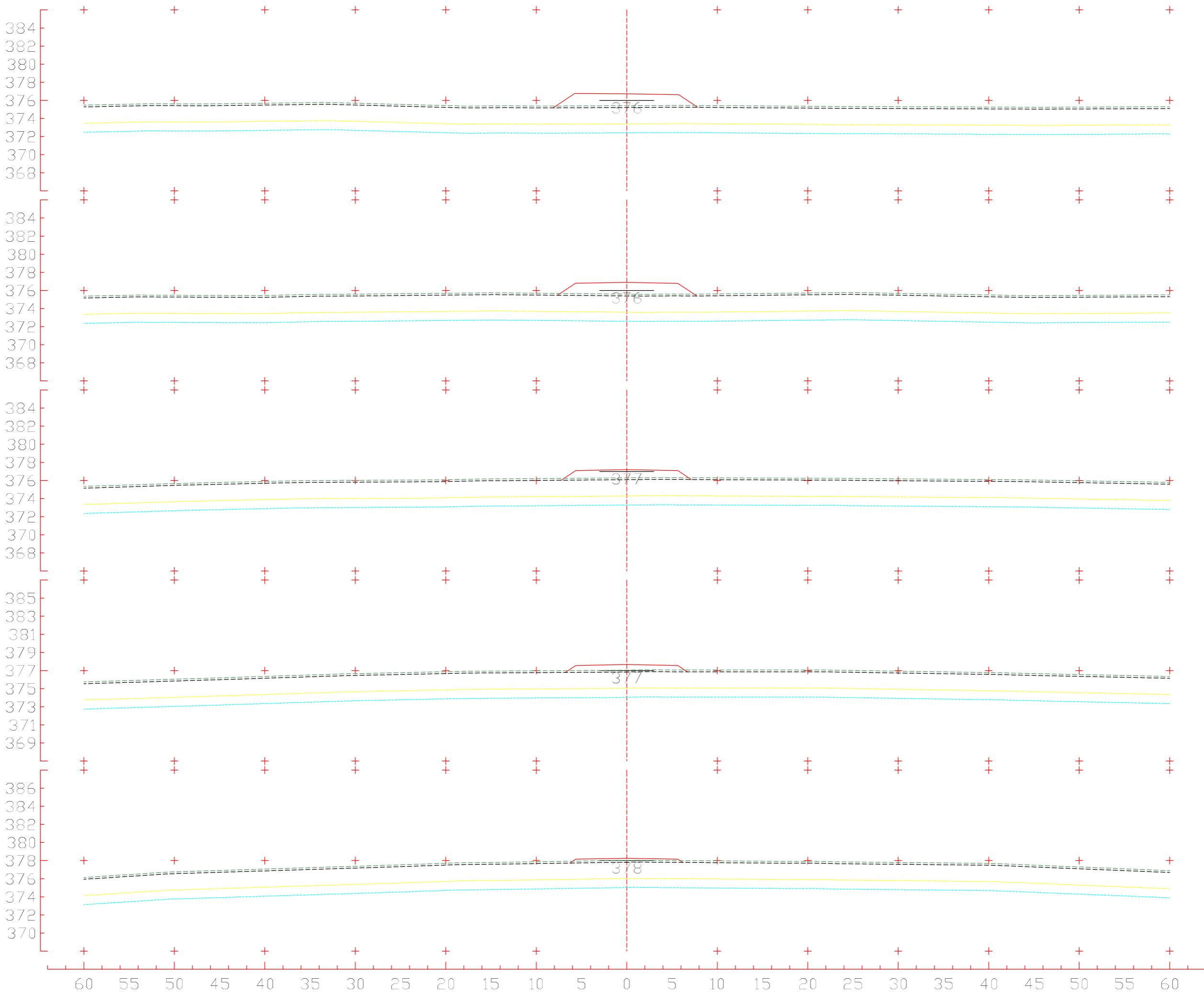
2+860
 CT 380,148 m
 CP 379,919 m

2+840
 CT 381,633 m
 CP 380,856 m

2+820
 CT 382,885 m
 CP 381,793 m

2+800
 CT 384,394 m
 CP 382,730 m

Eixo 1
 Escala 1:400



2+980
 CT 375,411 m
 CP 376,731 m

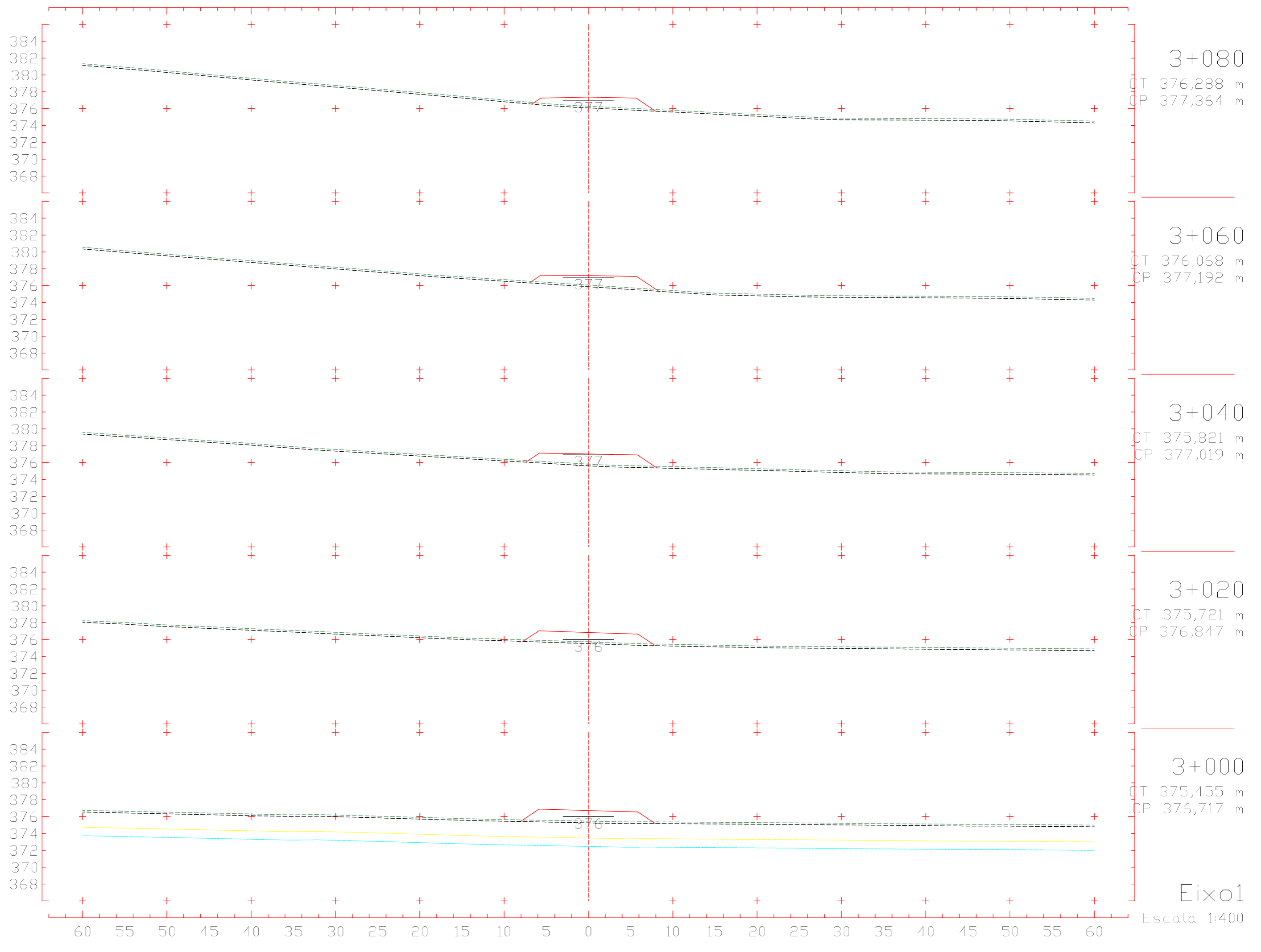
2+960
 CT 375,590 m
 CP 376,894 m

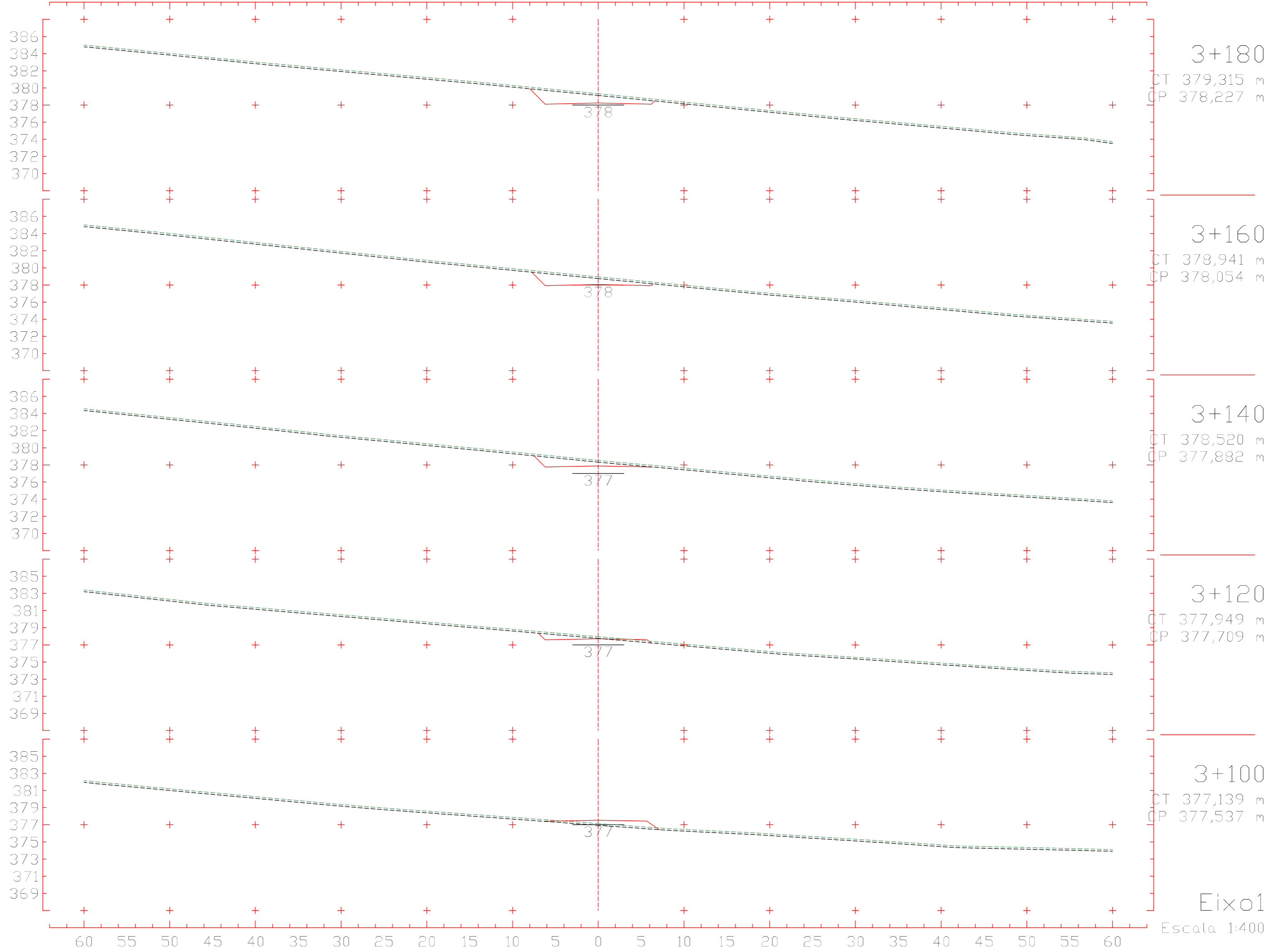
2+940
 CT 376,288 m
 CP 377,204 m

2+920
 CT 377,046 m
 CP 377,662 m

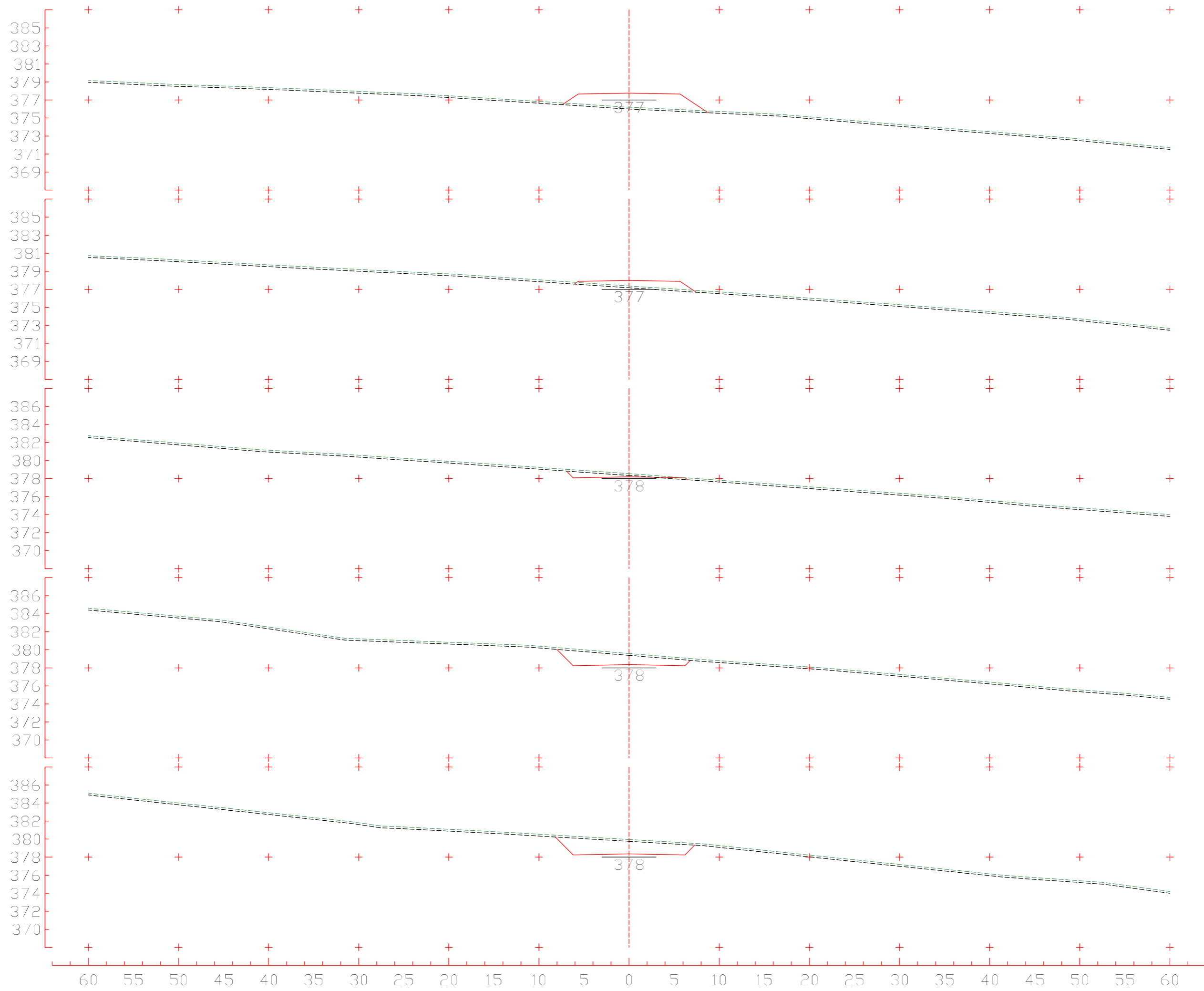
2+900
 CT 378,024 m
 CP 378,268 m

Eixo 01
 Escala 1:400





Eixo 01
Escala 1:400



3+280
 CT 376,199 m
 CP 377,767 m

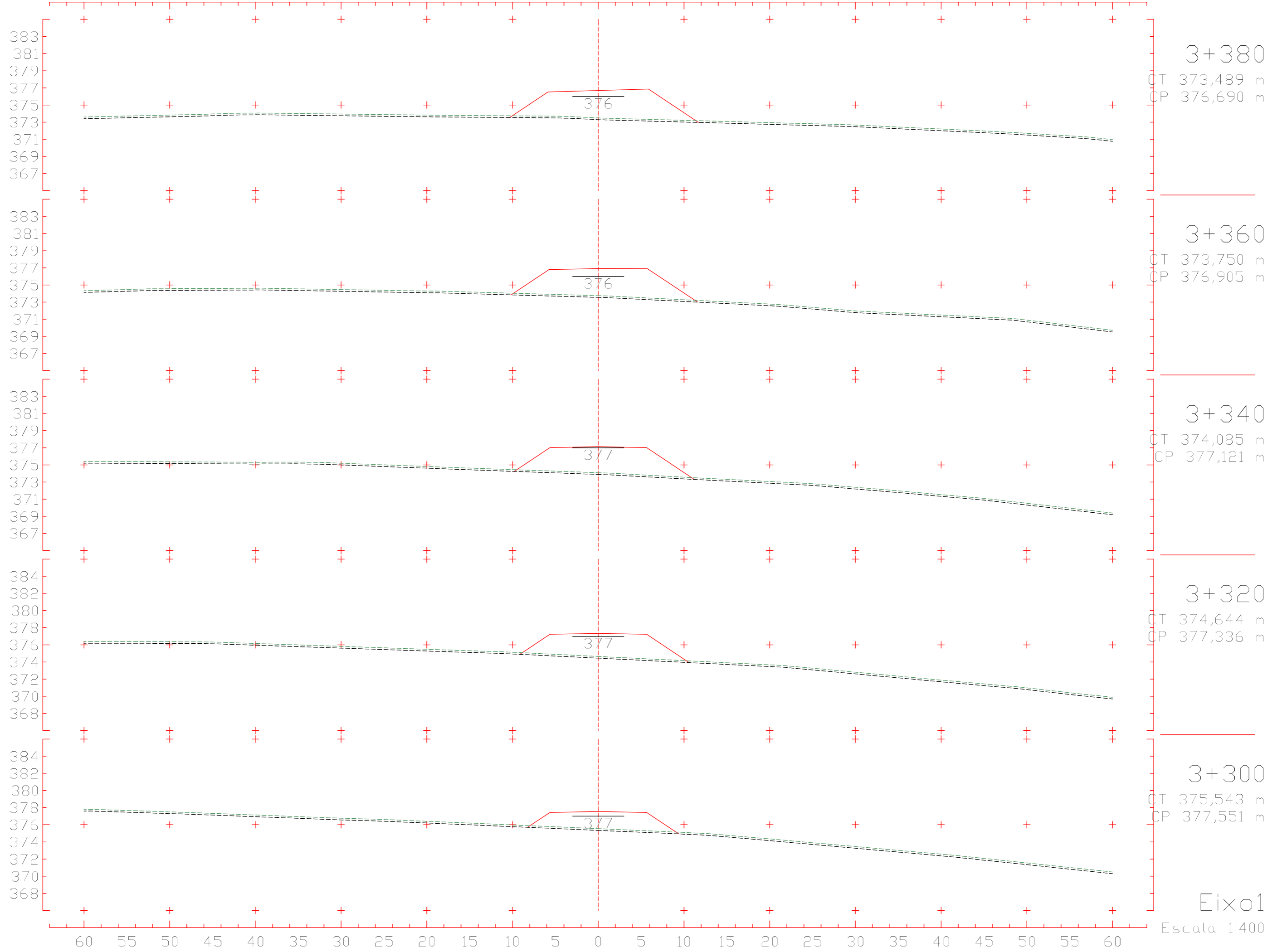
3+260
 CT 377,363 m
 CP 377,982 m

3+240
 CT 378,549 m
 CP 378,197 m

3+220
 CT 379,588 m
 CP 378,358 m

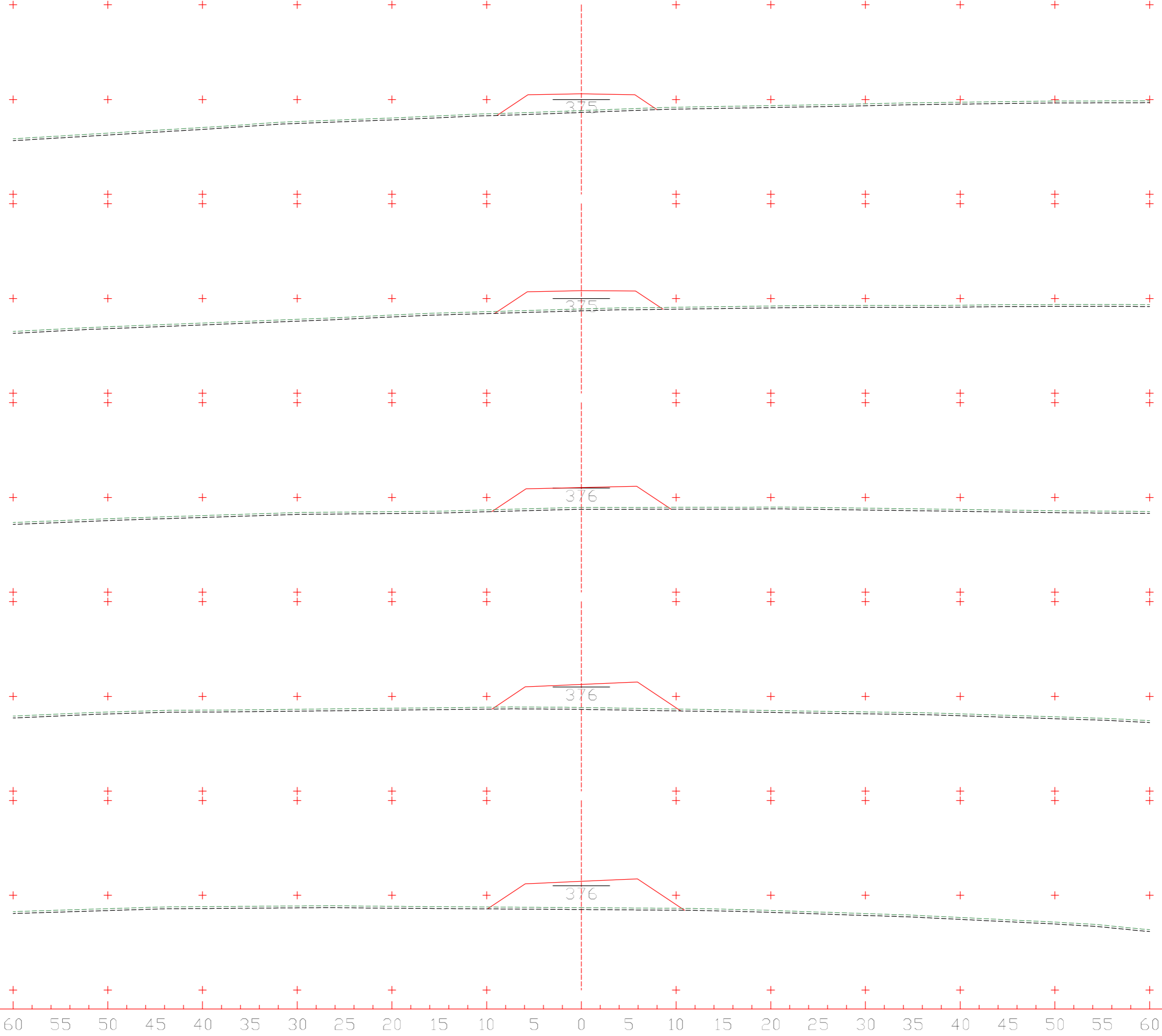
3+200
 CT 379,956 m
 CP 378,365 m

Eixo 01
 Escala 1:400



Eixo 1
Escala 1:400

383
381
379
377
375
373
371
369
367



3+480
CT 373,836 m
CP 375,613 m

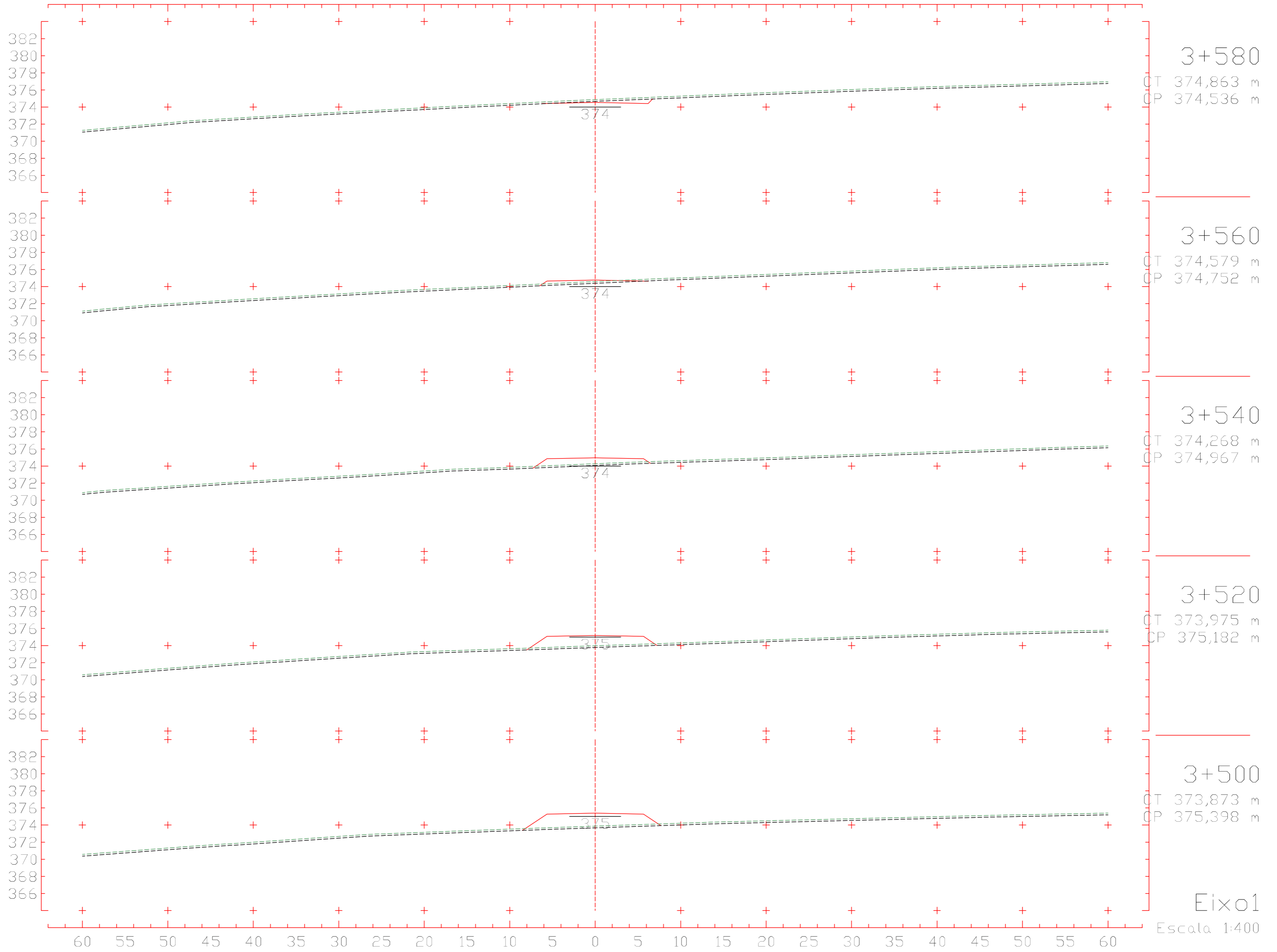
3+460
CT 373,895 m
CP 375,829 m

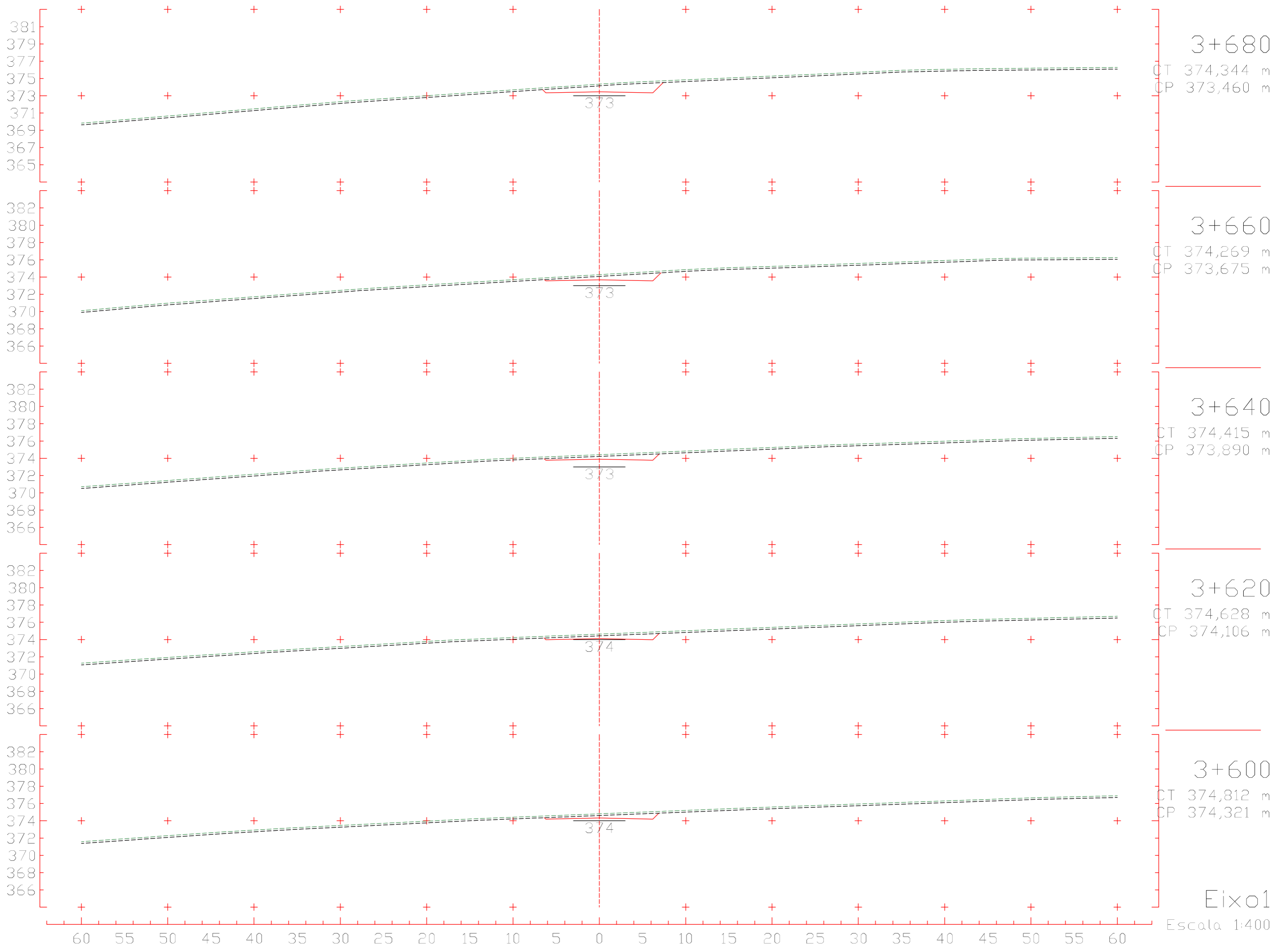
3+440
CT 373,940 m
CP 376,044 m

3+420
CT 373,826 m
CP 376,259 m

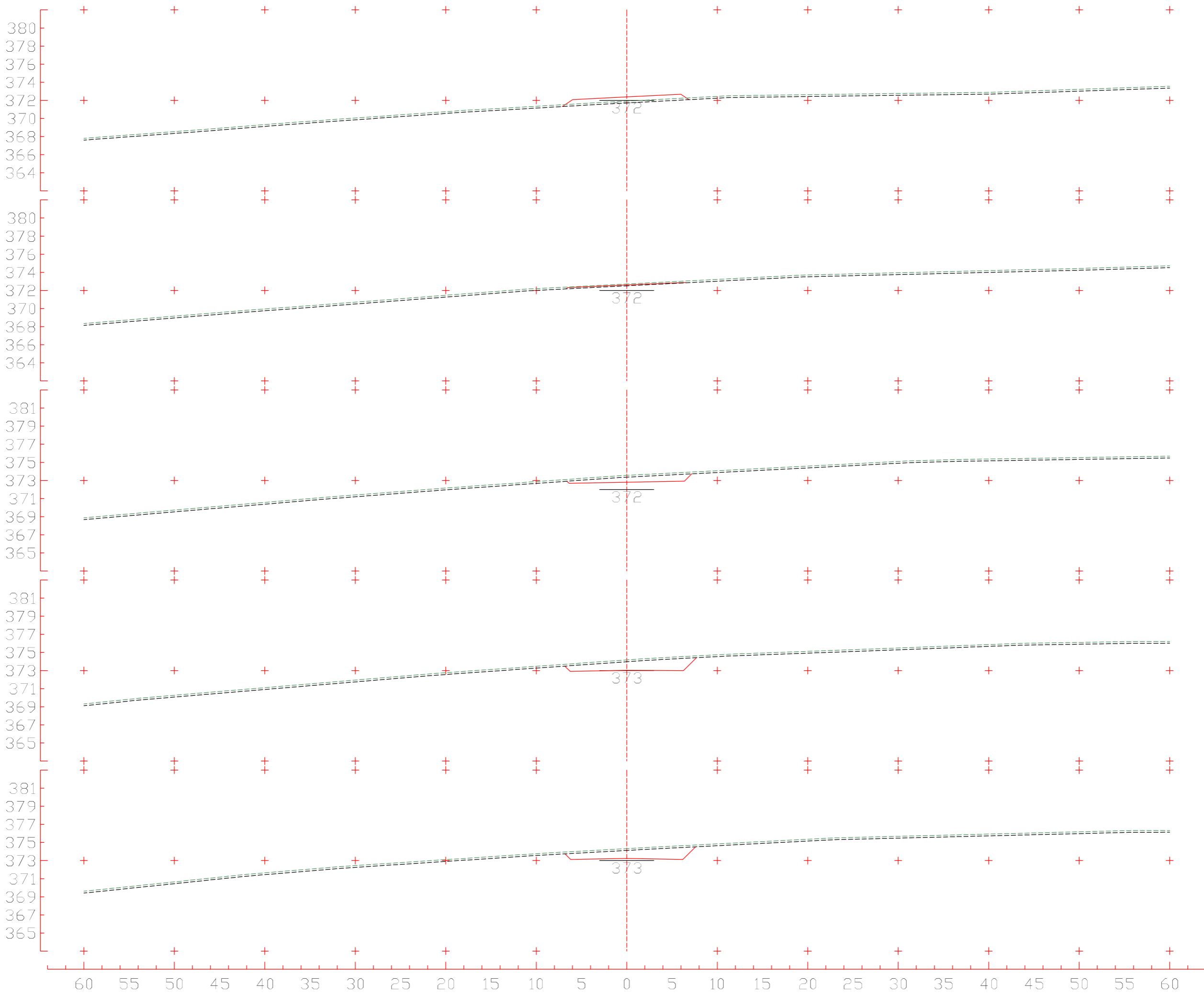
3+400
CT 373,698 m
CP 376,475 m

Eixo 01
Escala 1:400





Eixo 01
Escala 1:400



3+780
 CT 371,913 m
 CP 372,383 m

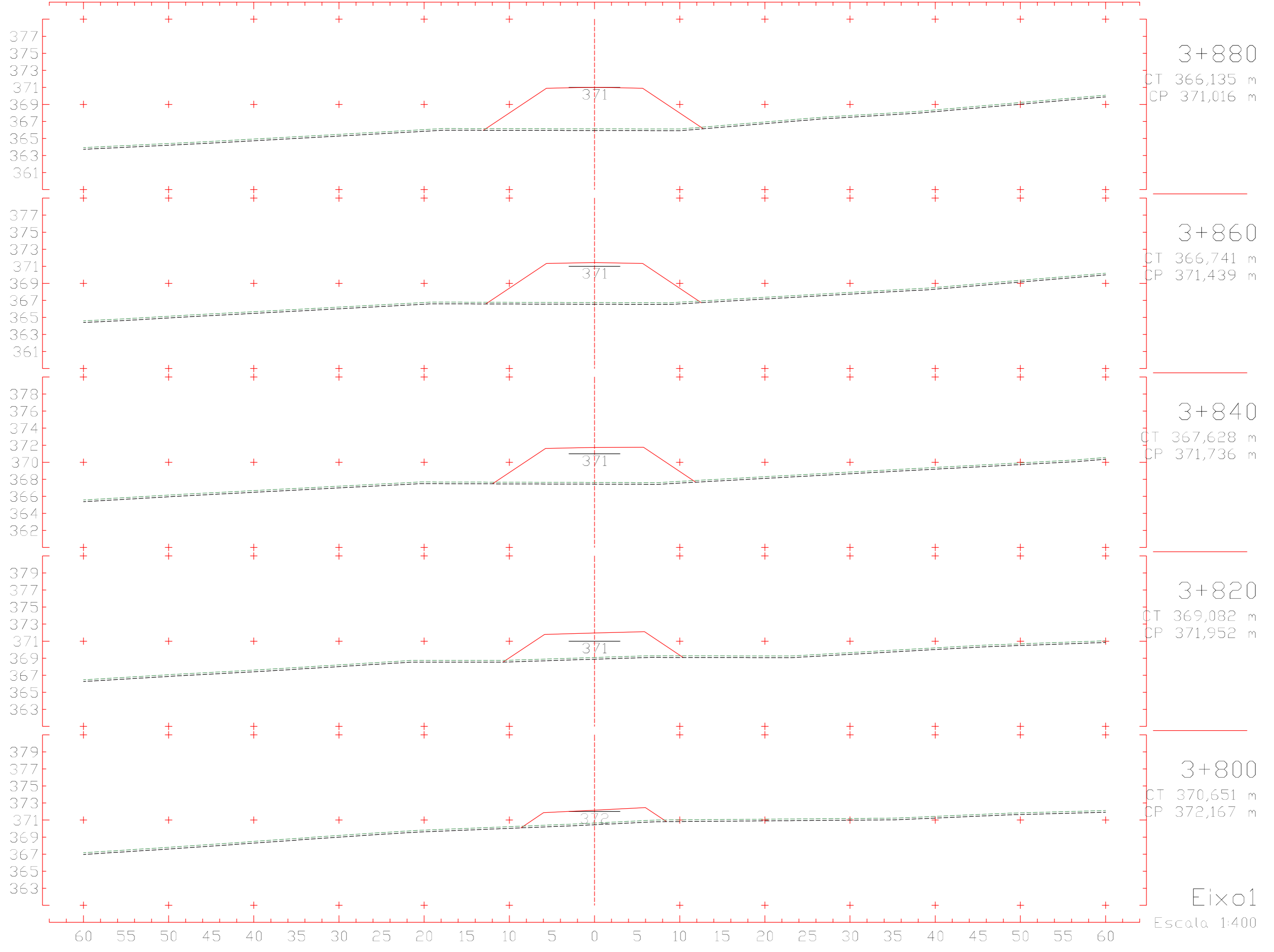
3+760
 CT 372,709 m
 CP 372,598 m

3+740
 CT 373,565 m
 CP 372,814 m

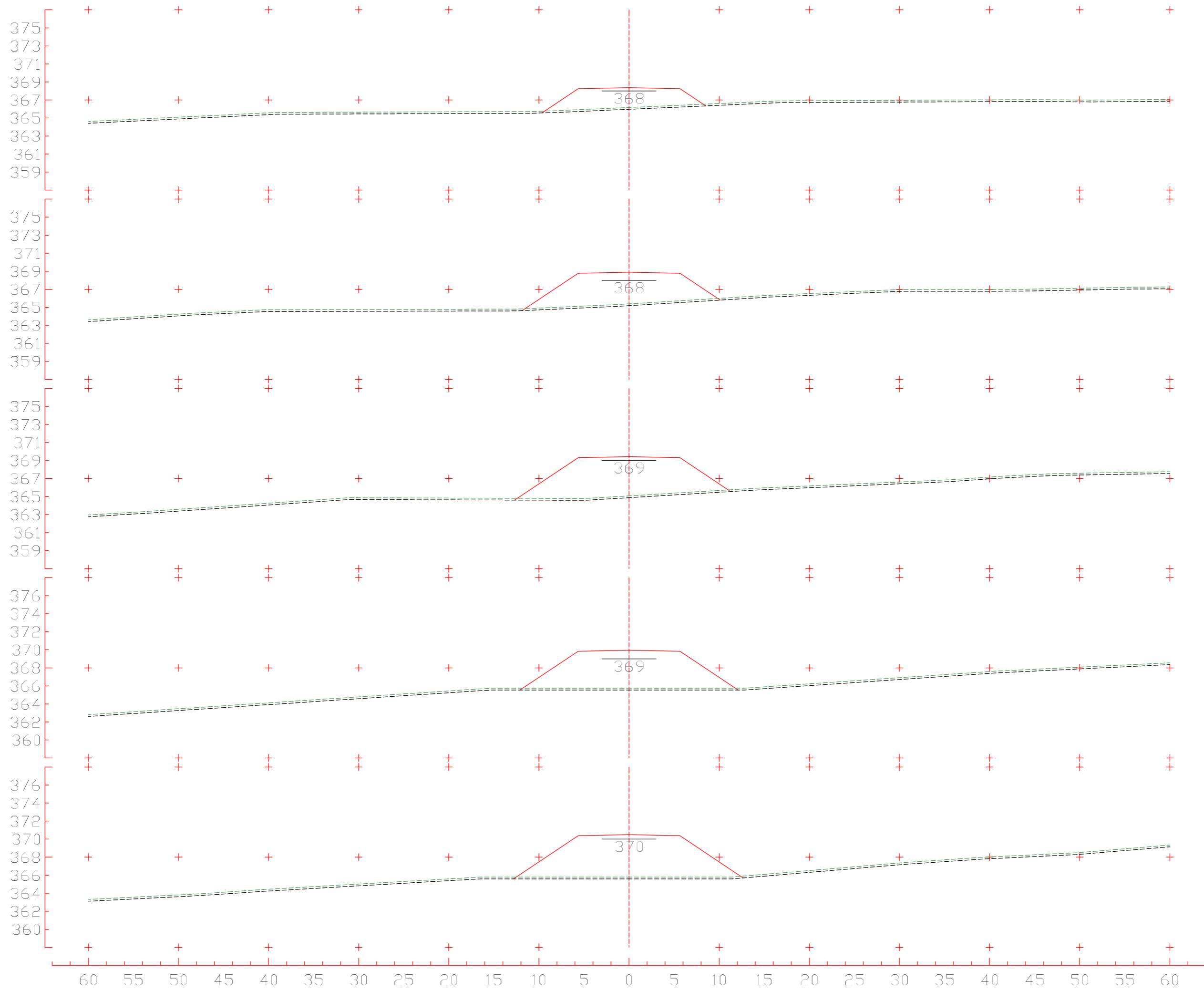
3+720
 CT 374,173 m
 CP 373,029 m

3+700
 CT 374,321 m
 CP 373,244 m

Eixo 01
 Escala 1:400



Eixo 1
Escala 1:400



3+980
 CT 366,167 m
 CP 368,362 m

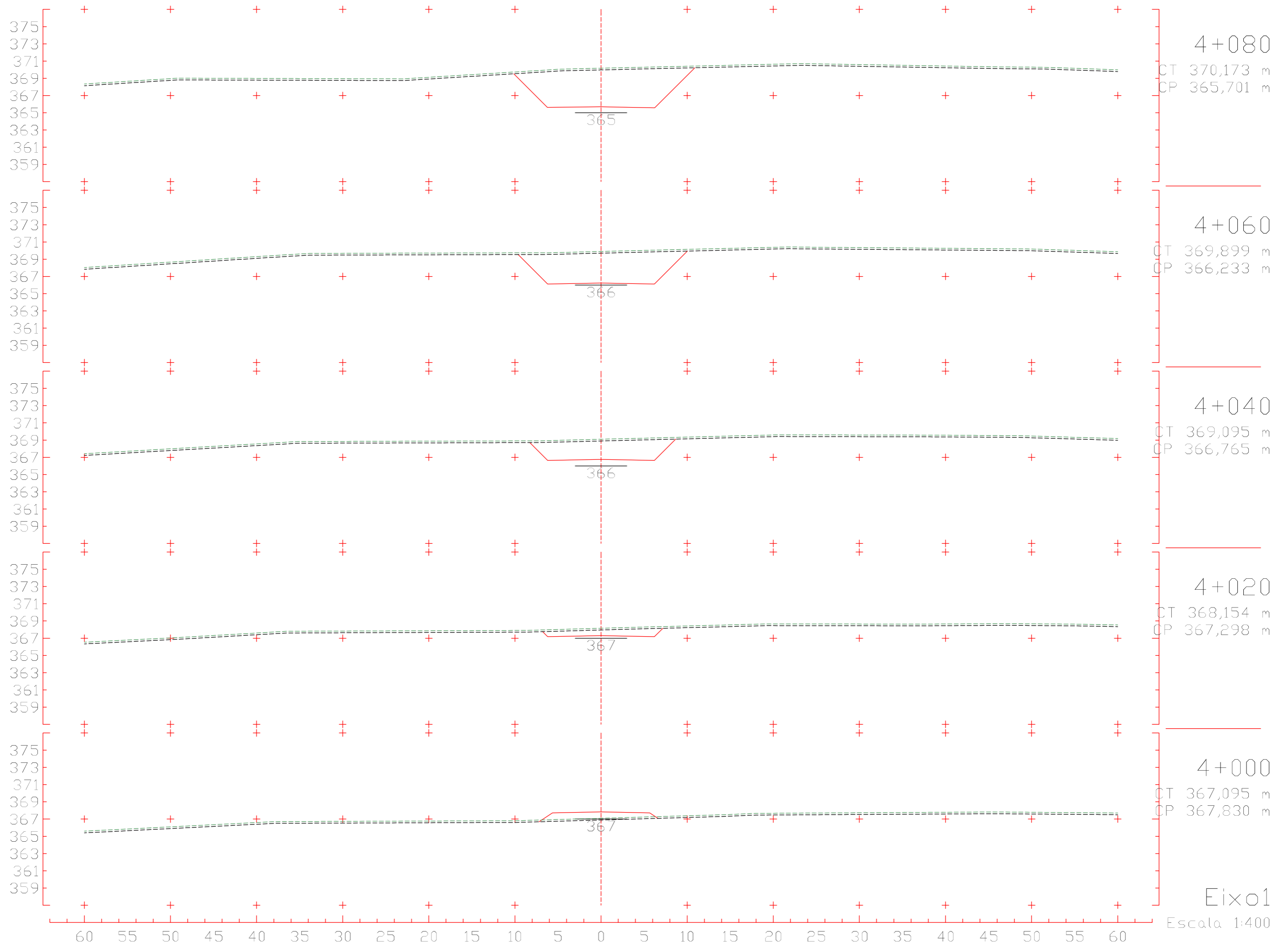
3+960
 CT 365,379 m
 CP 368,895 m

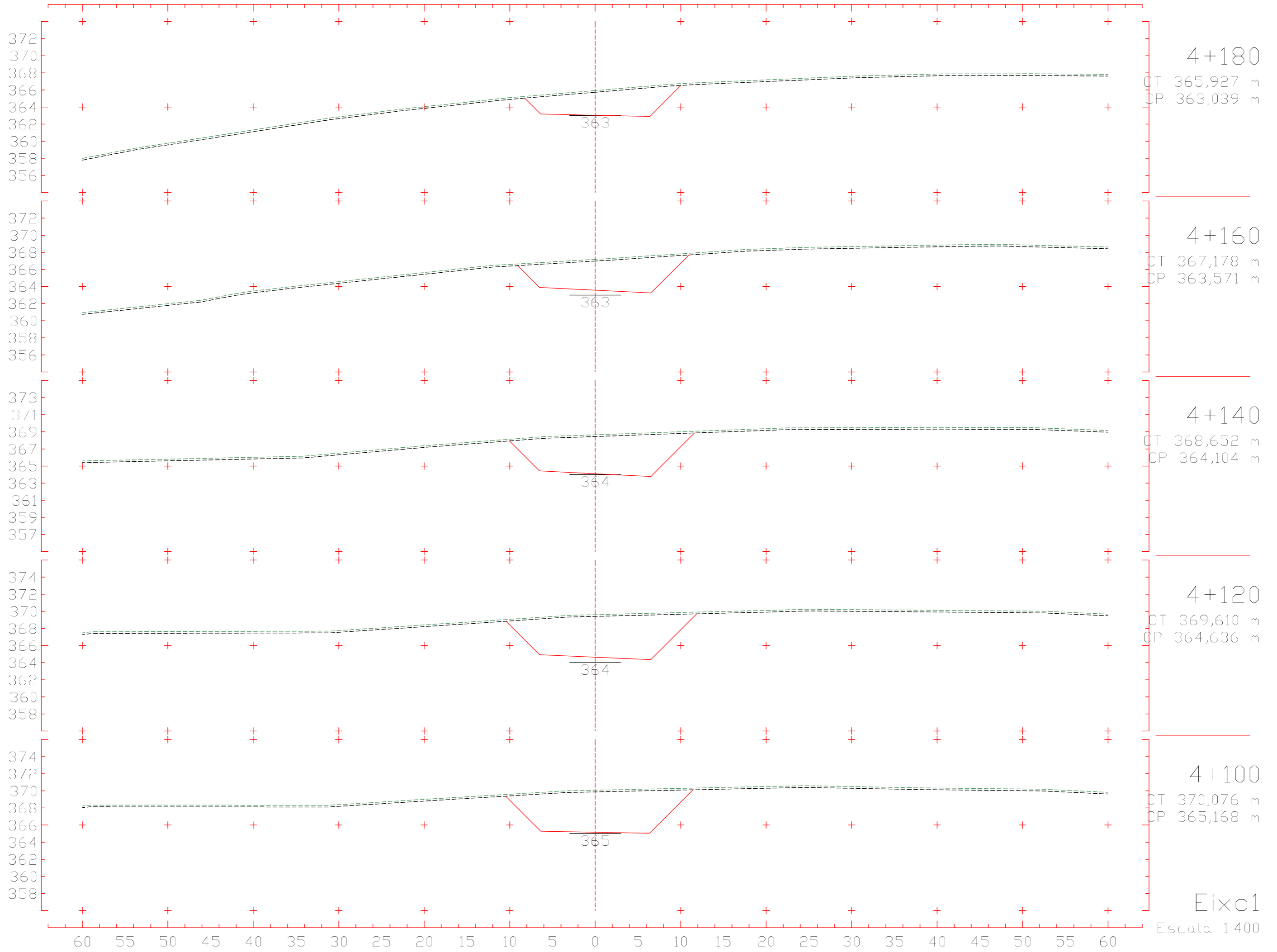
3+940
 CT 365,079 m
 CP 369,427 m

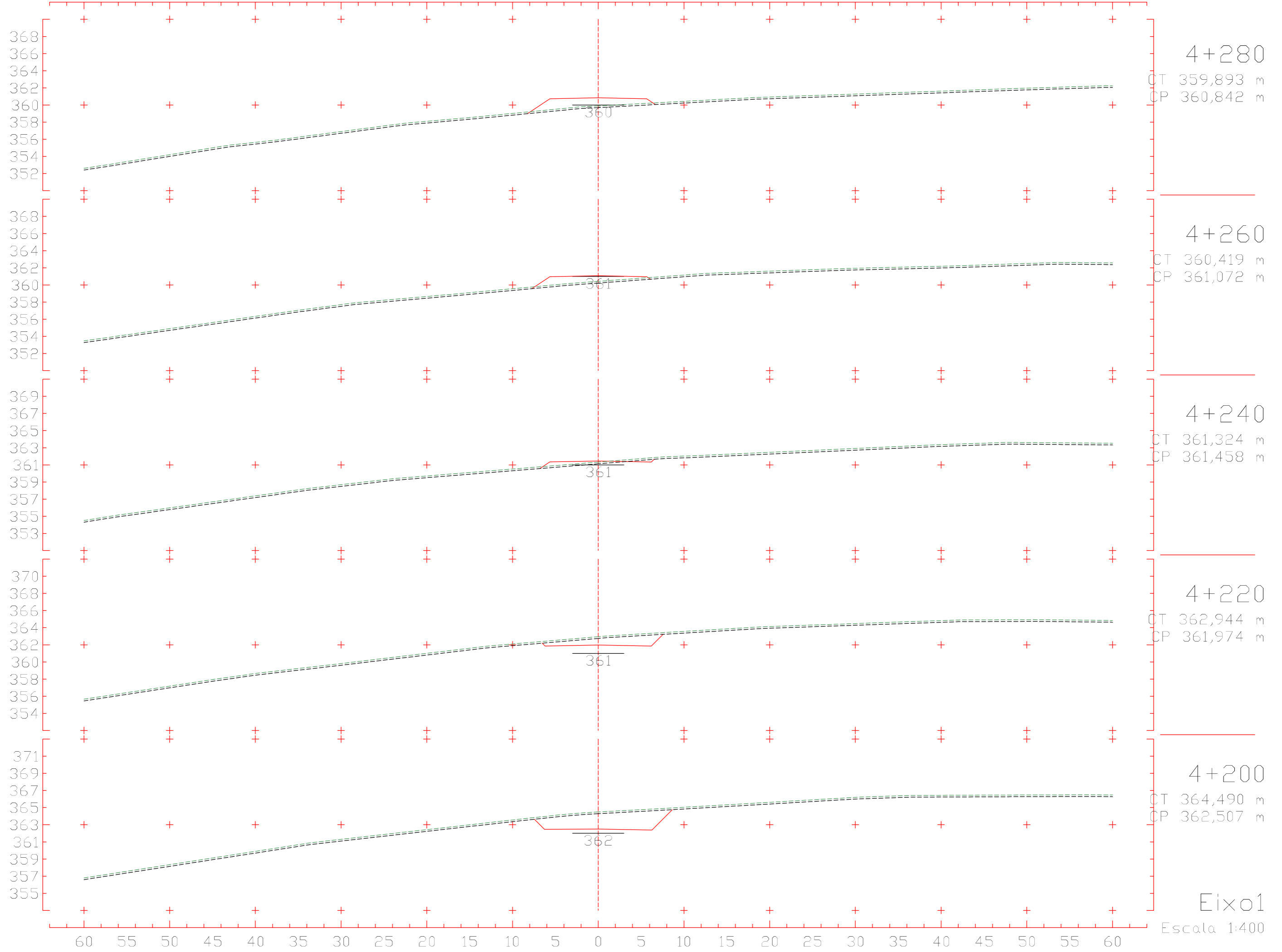
3+920
 CT 365,738 m
 CP 369,960 m

3+900
 CT 365,787 m
 CP 370,492 m

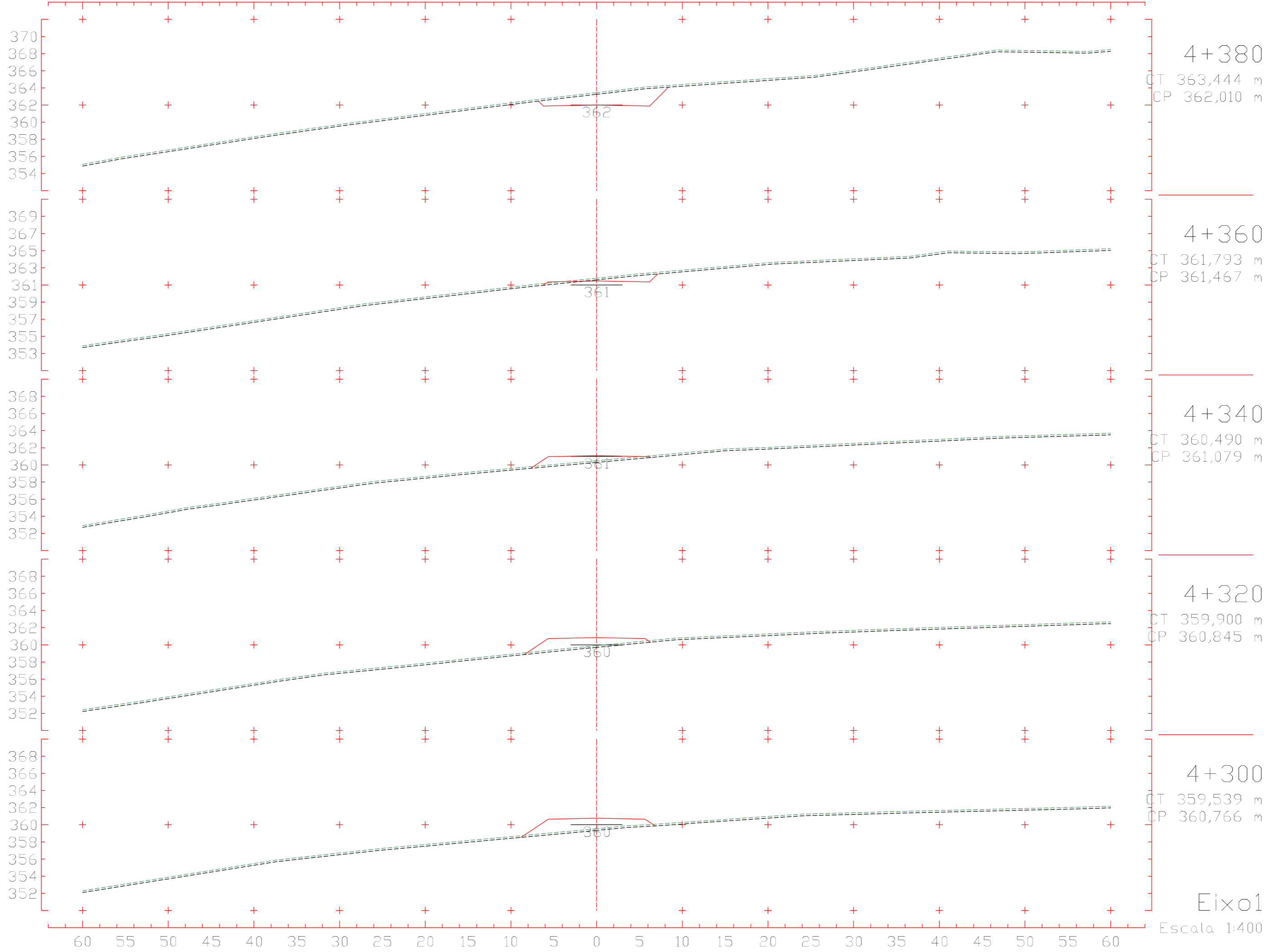
Eixo 01
 Escala 1:400

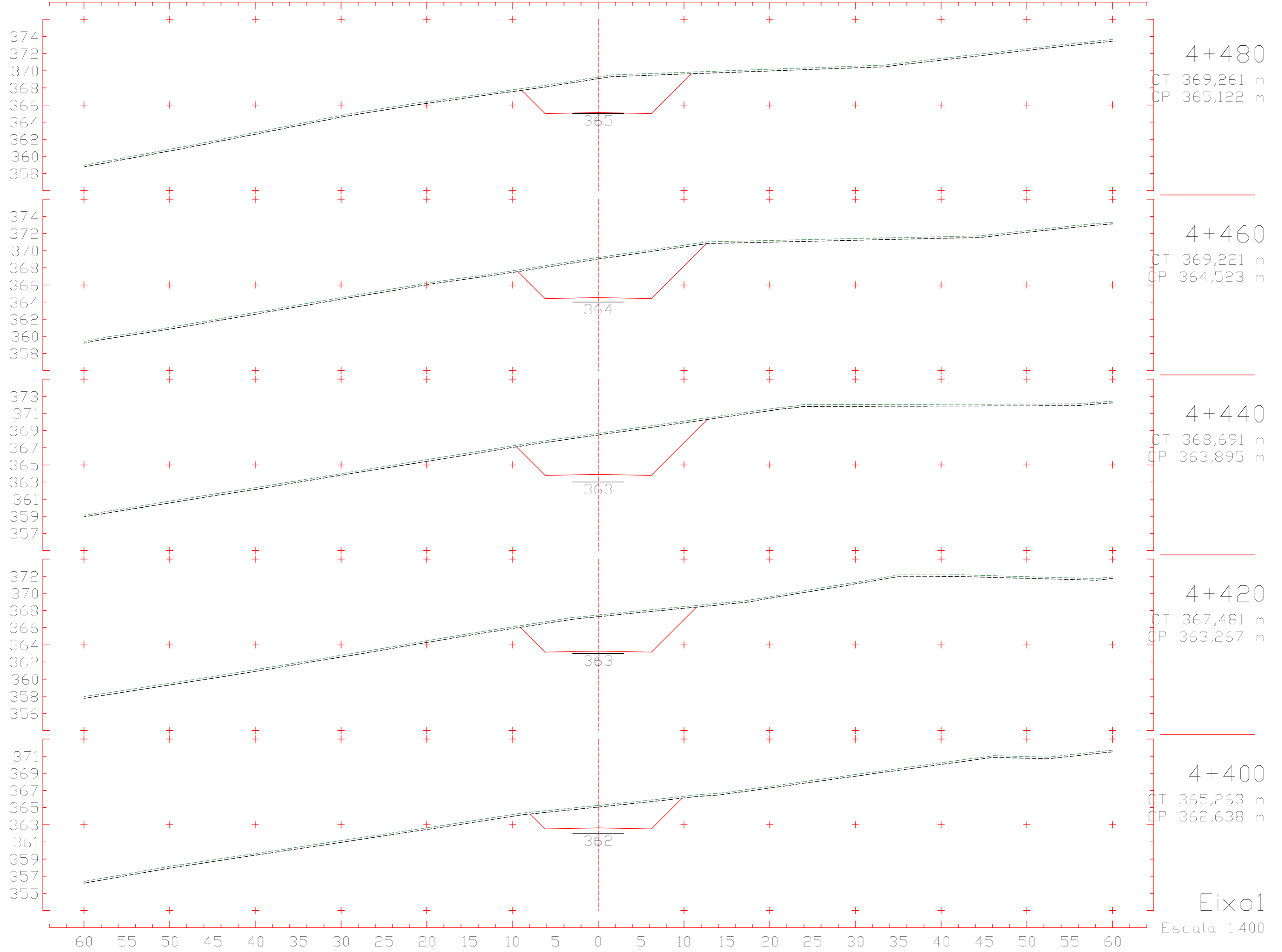


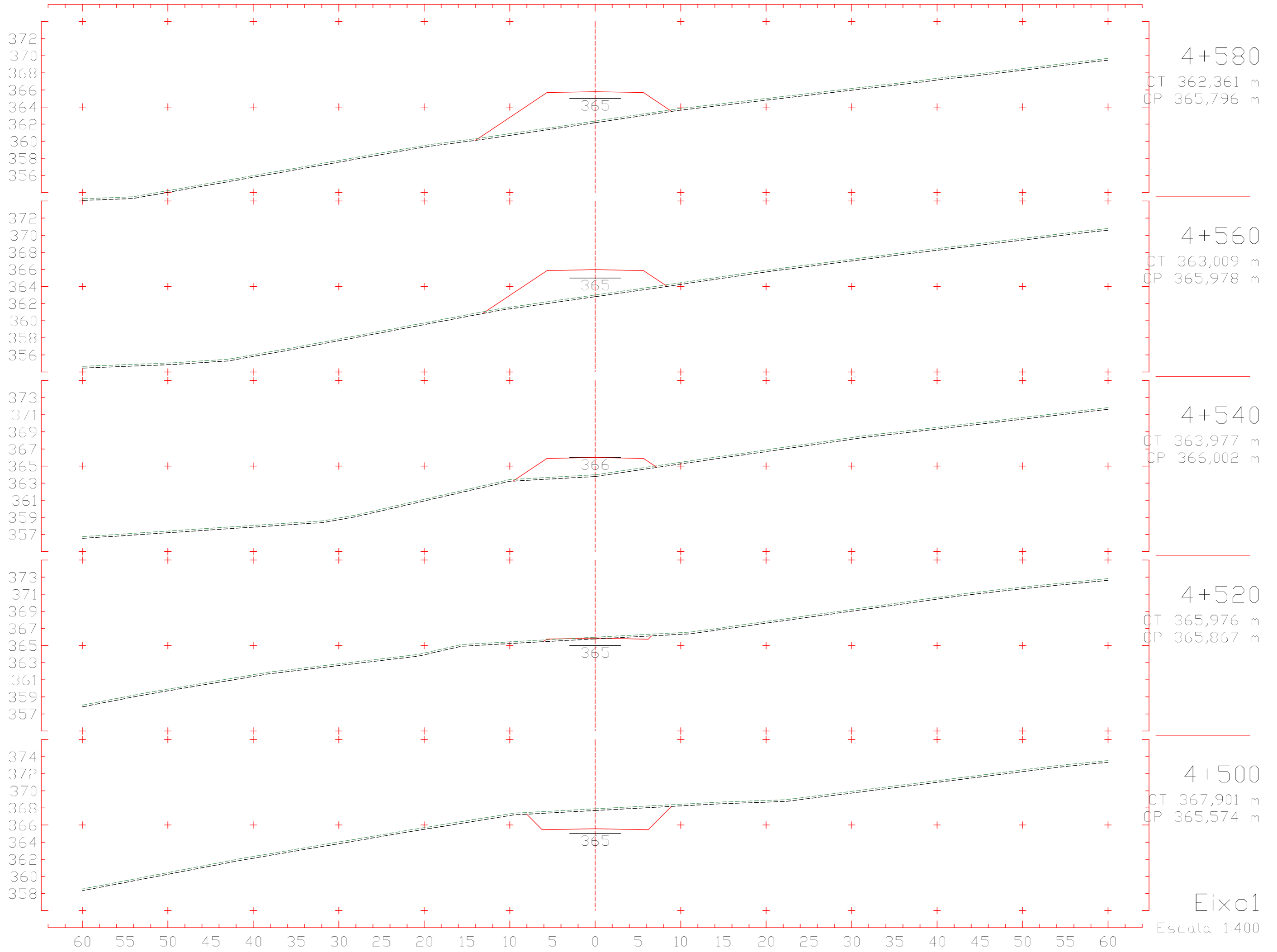


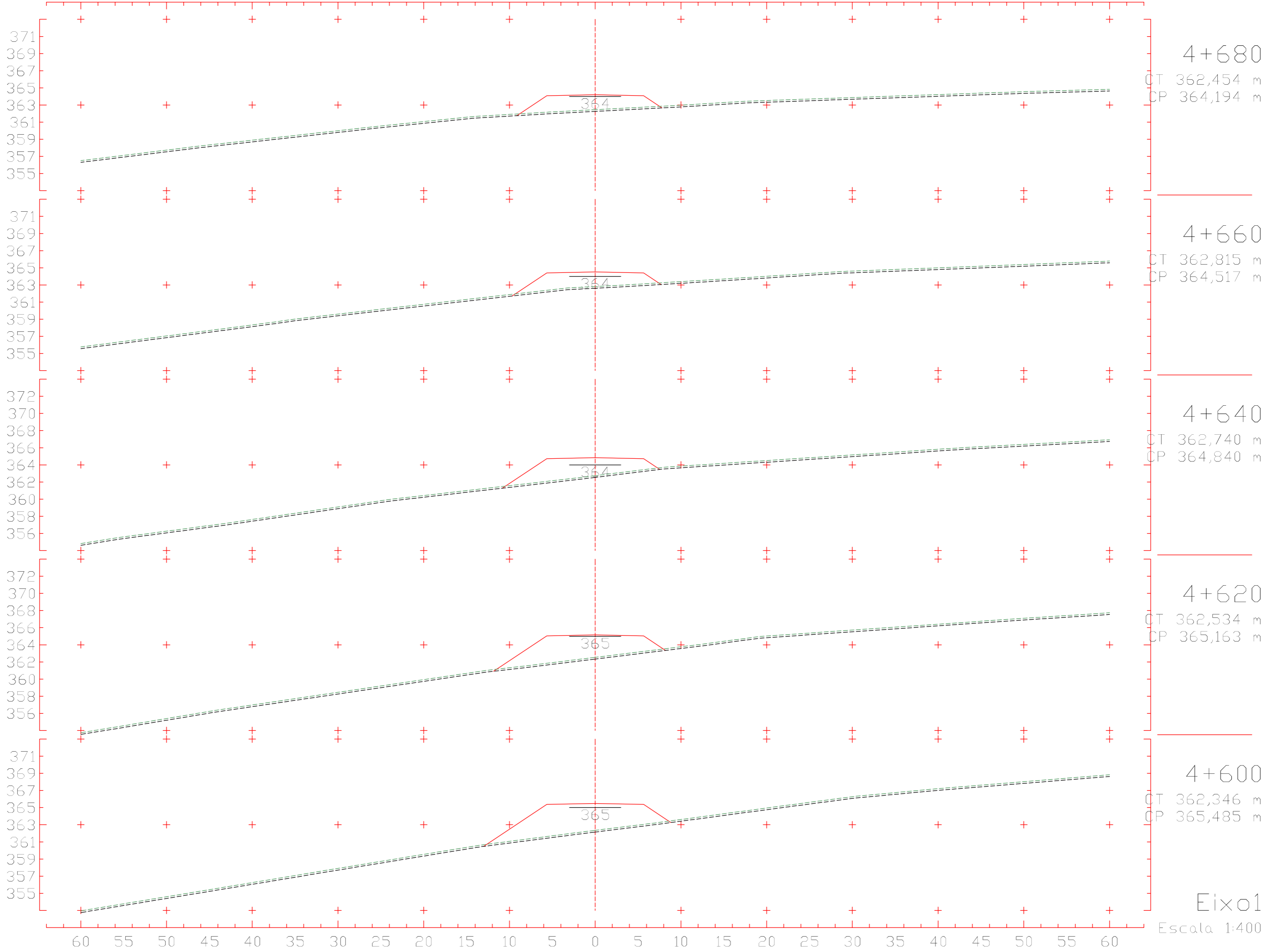


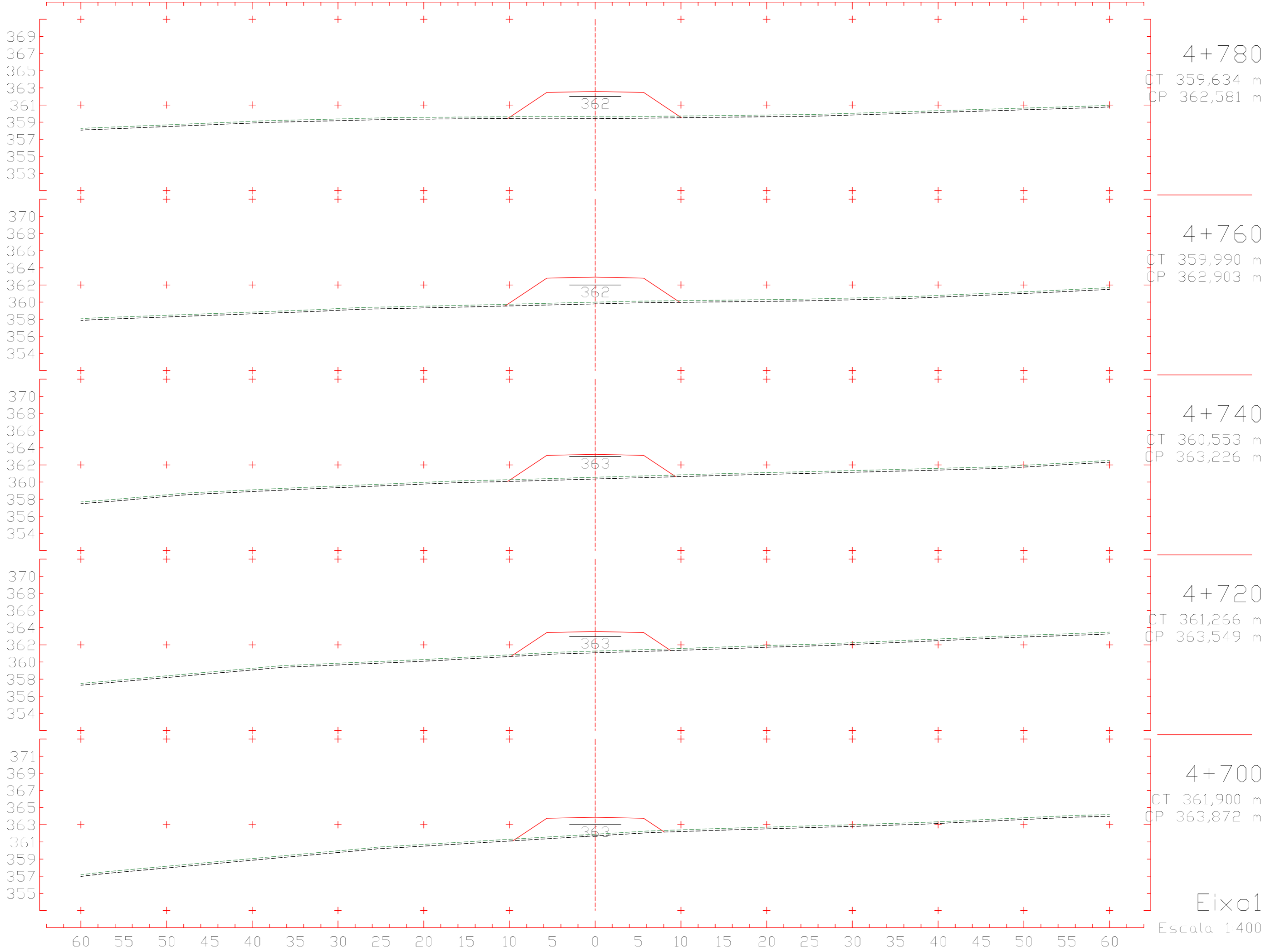
Eixol1
Escala 1:400



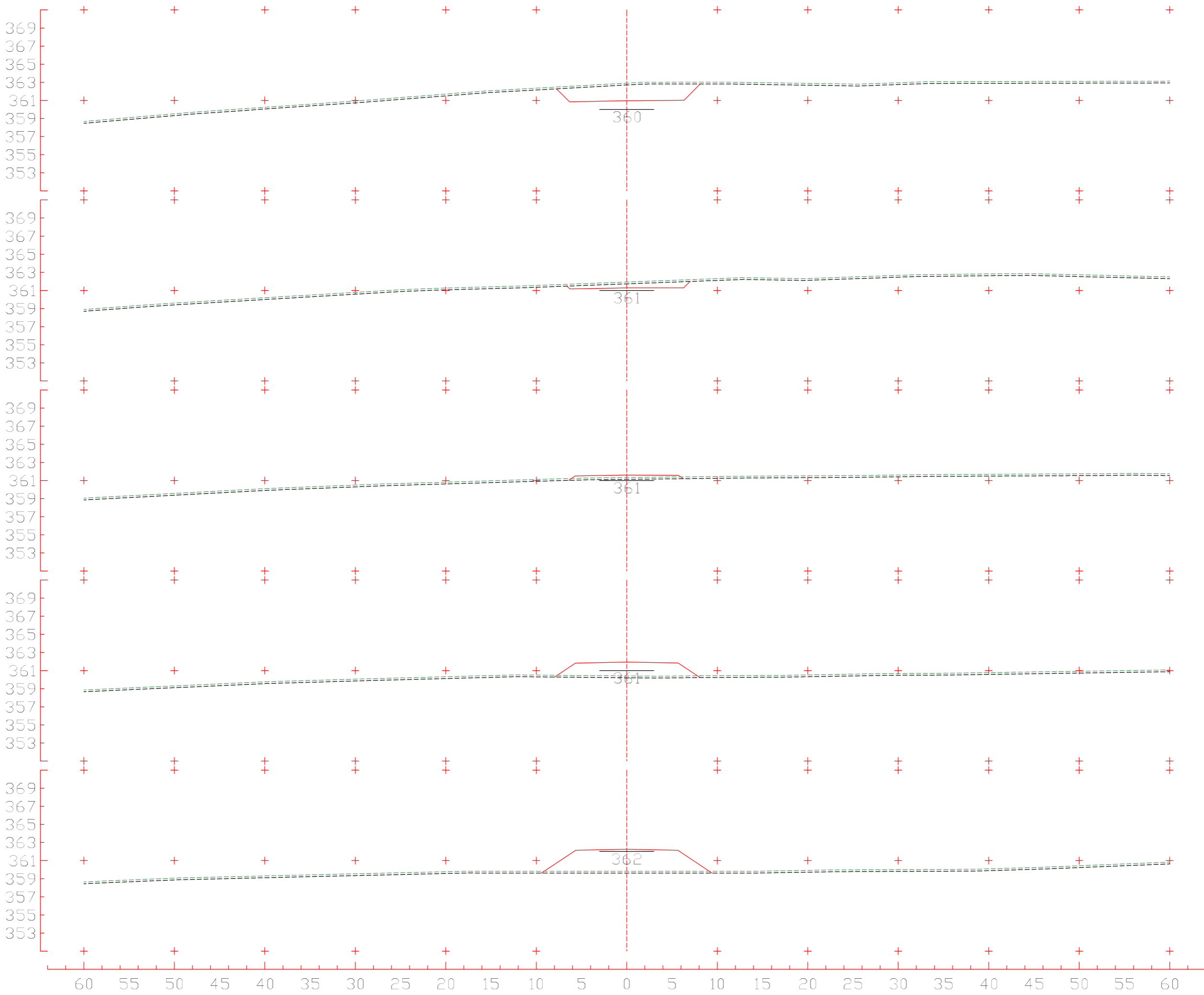








Eixo 01
Escala 1:400



4+880
 CT 362,902 m
 CP 360,967 m

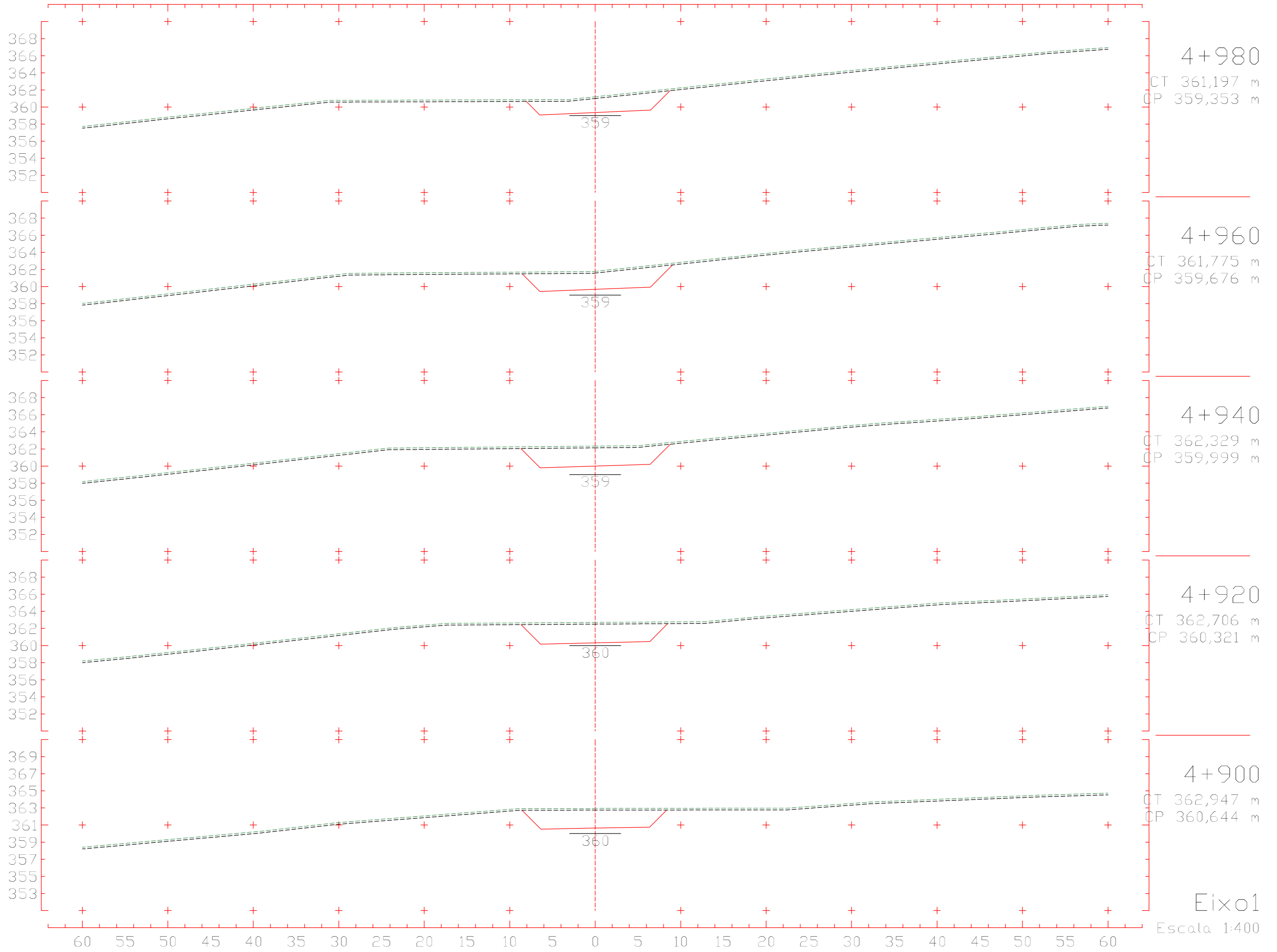
4+860
 CT 361,926 m
 CP 361,290 m

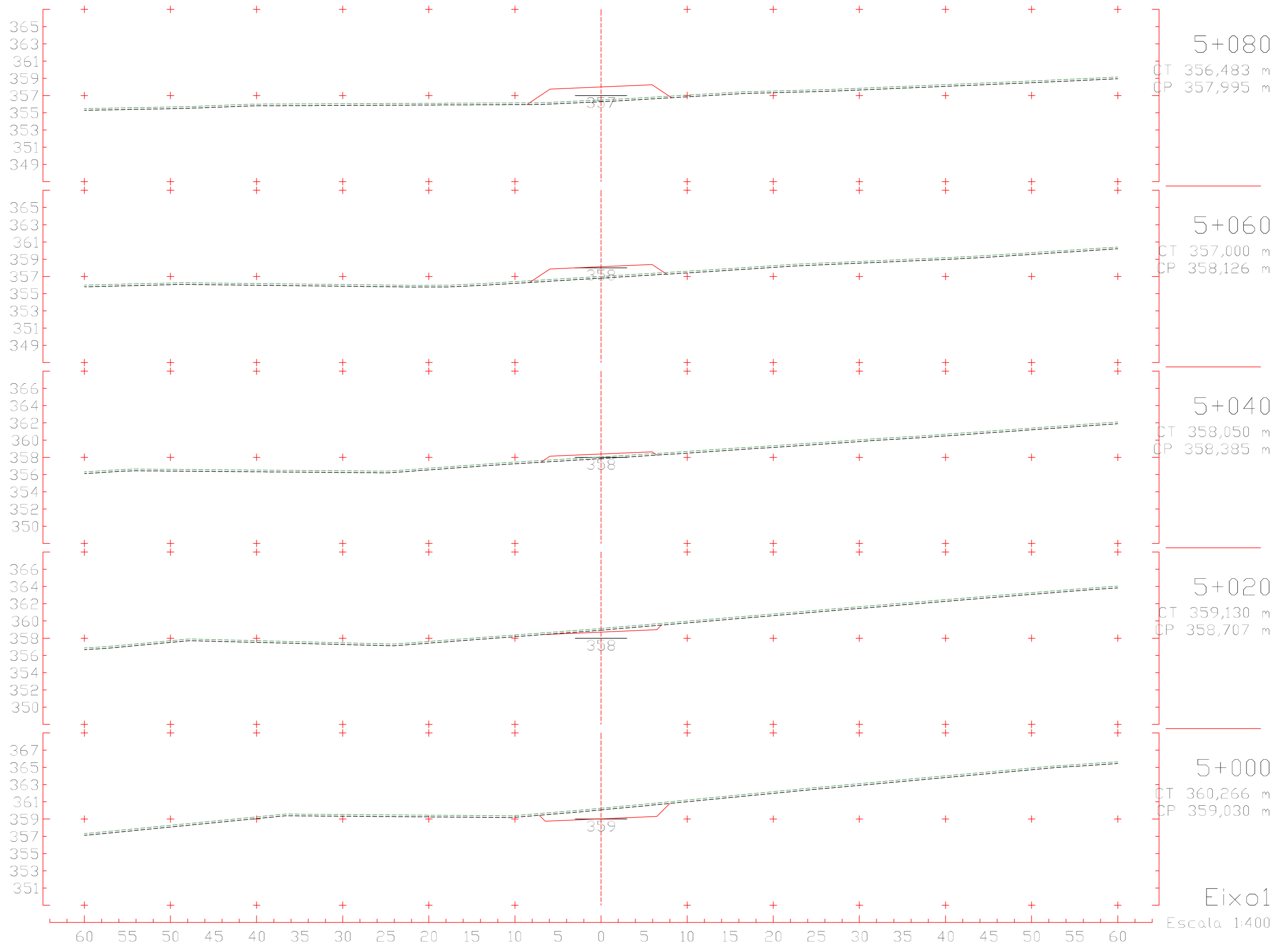
4+840
 CT 361,326 m
 CP 361,612 m

4+820
 CT 360,402 m
 CP 361,935 m

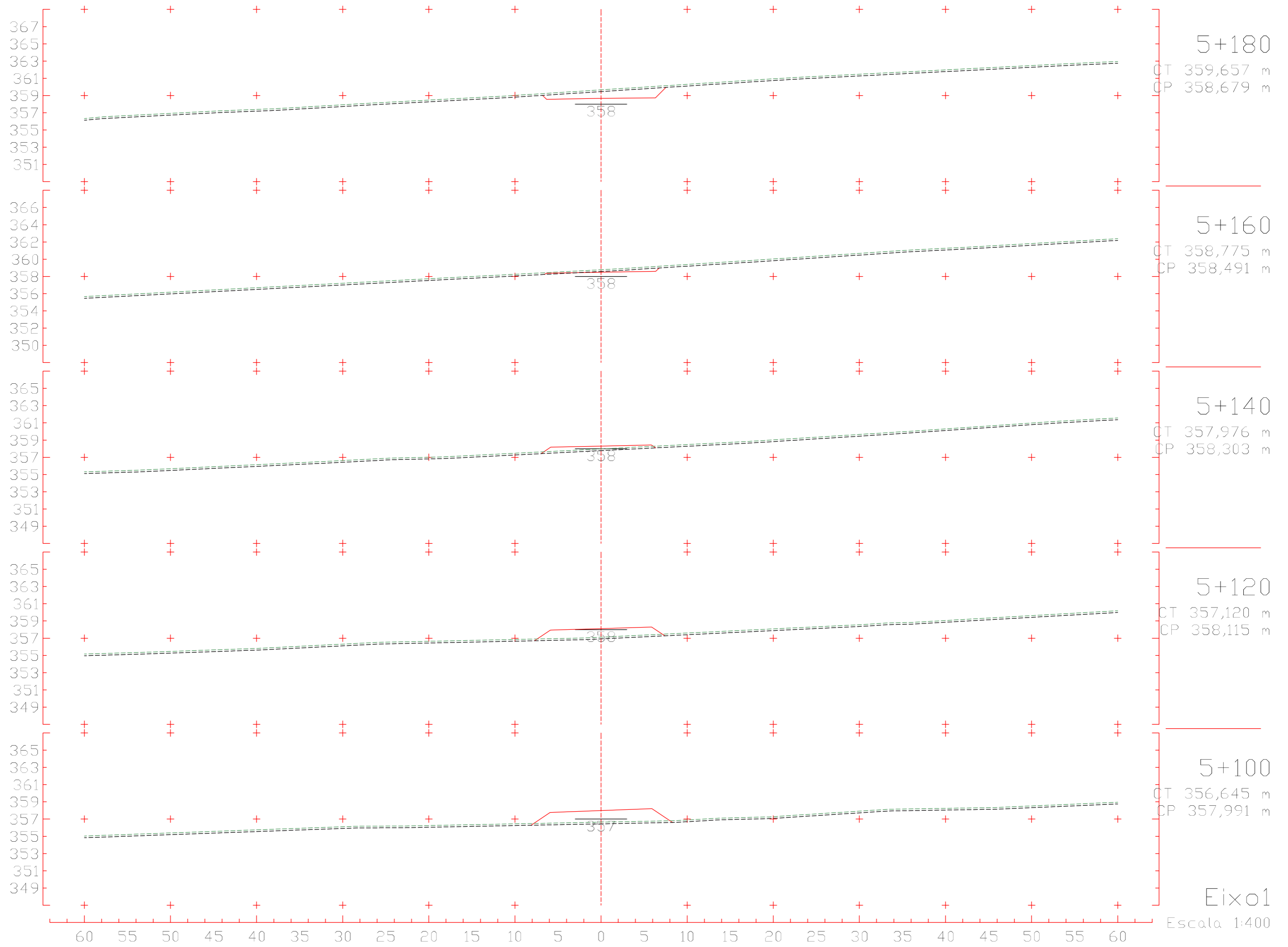
4+800
 CT 359,824 m
 CP 362,258 m

Eixo 01
 Escala 1:400

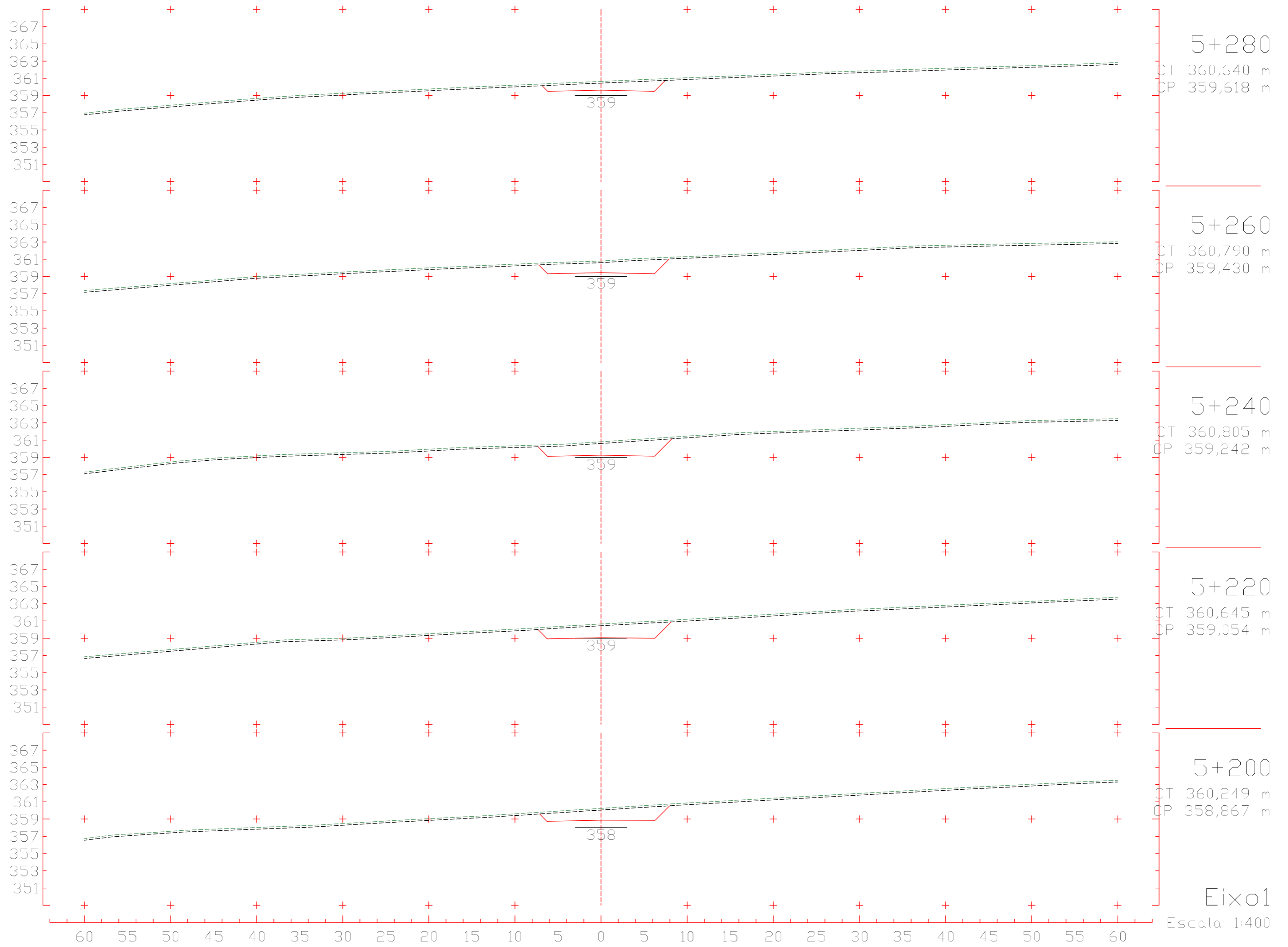


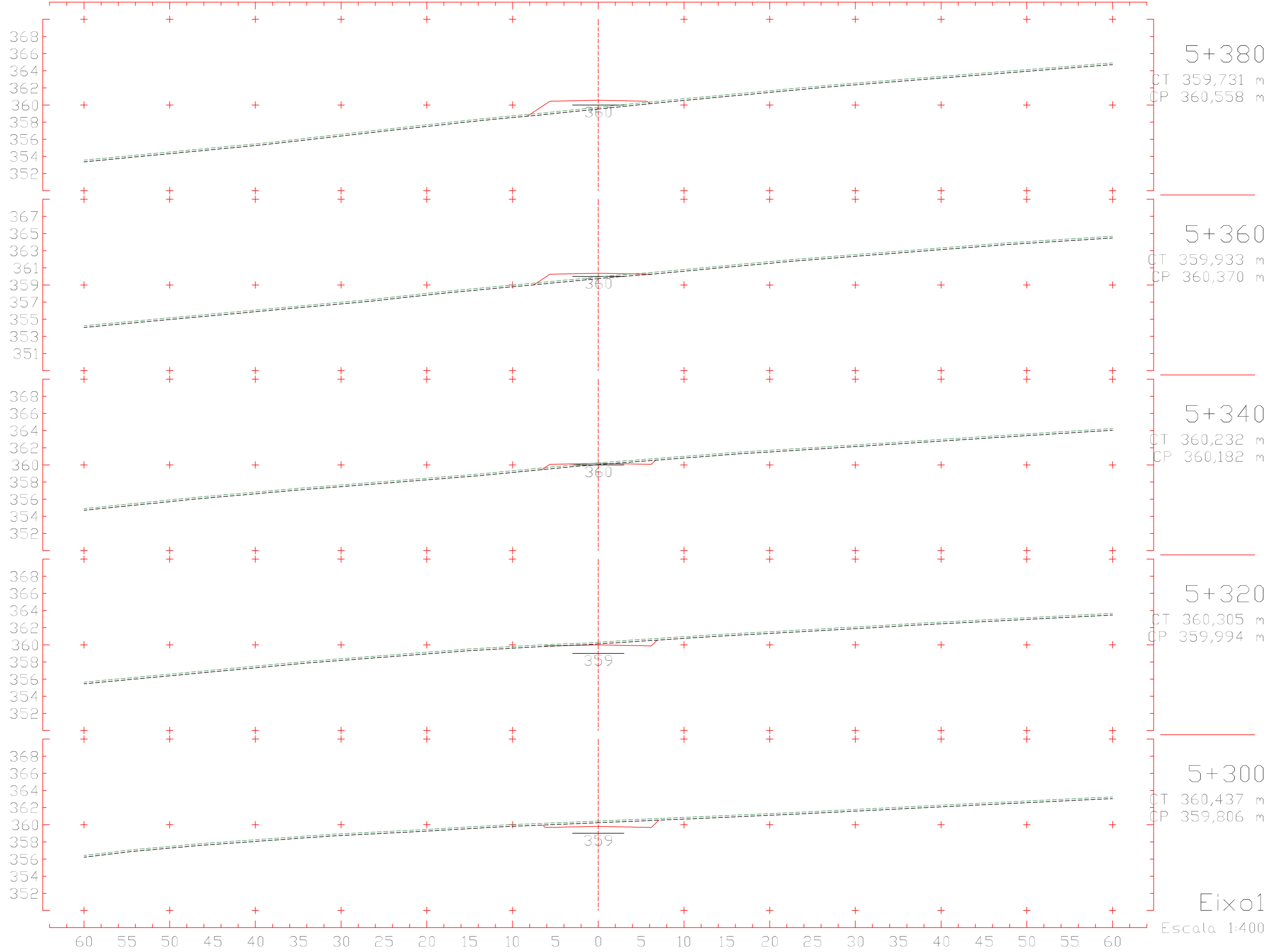


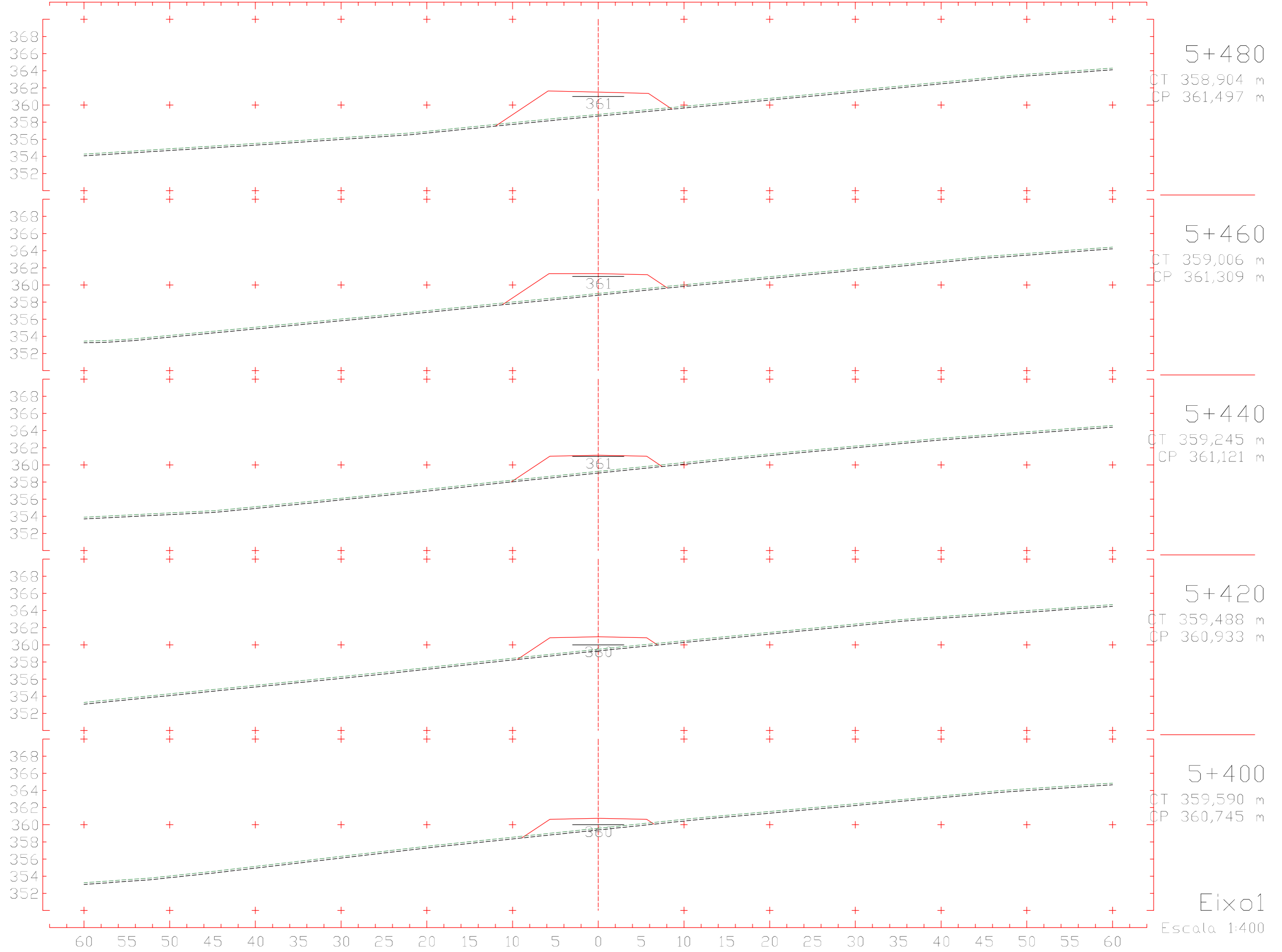
Escala 1:400



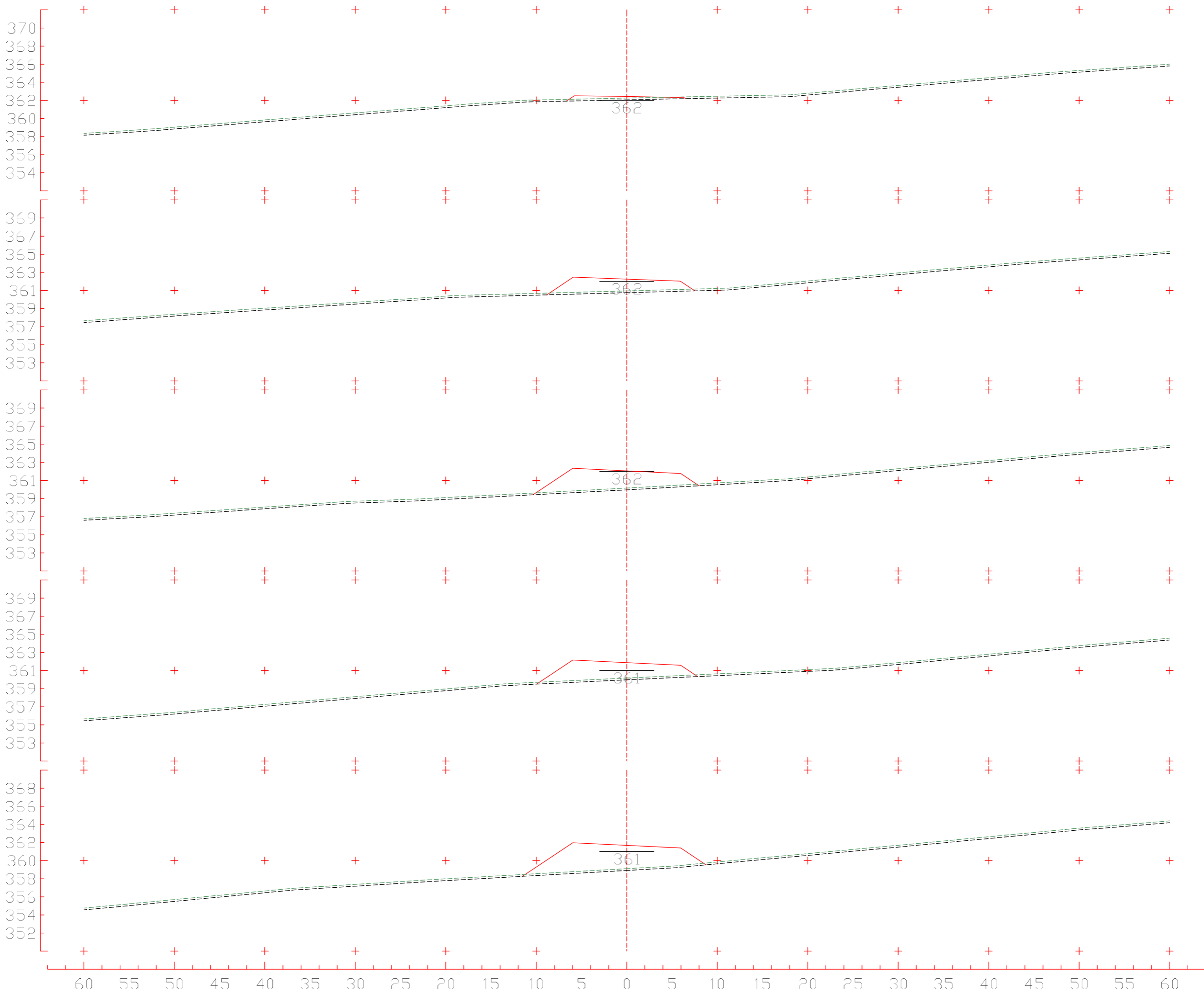
Eixoi1
Escala 1:400

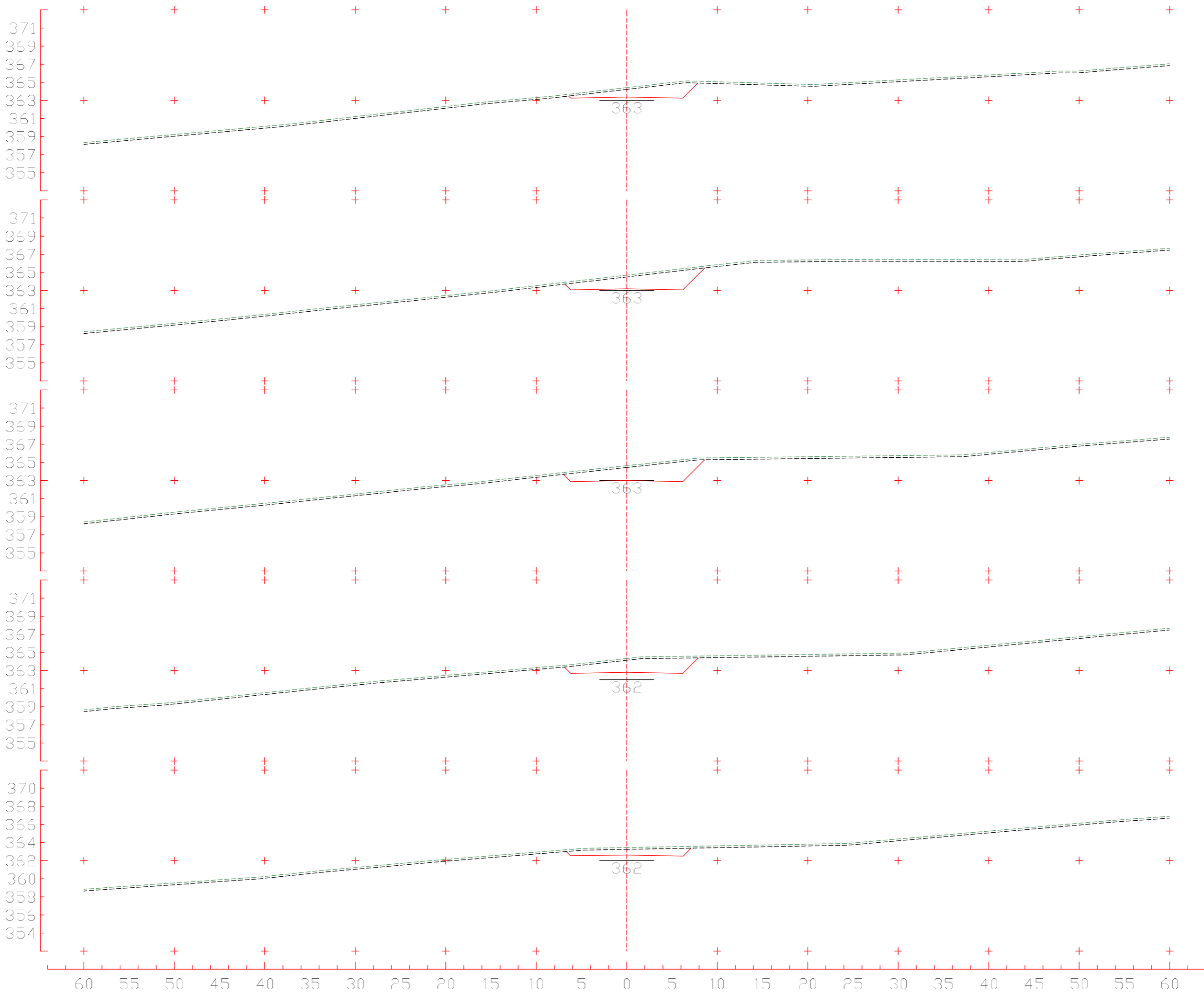






Eixo 01
Escala 1:400





5+680
 CT 364,409 m
 CP 363,376 m

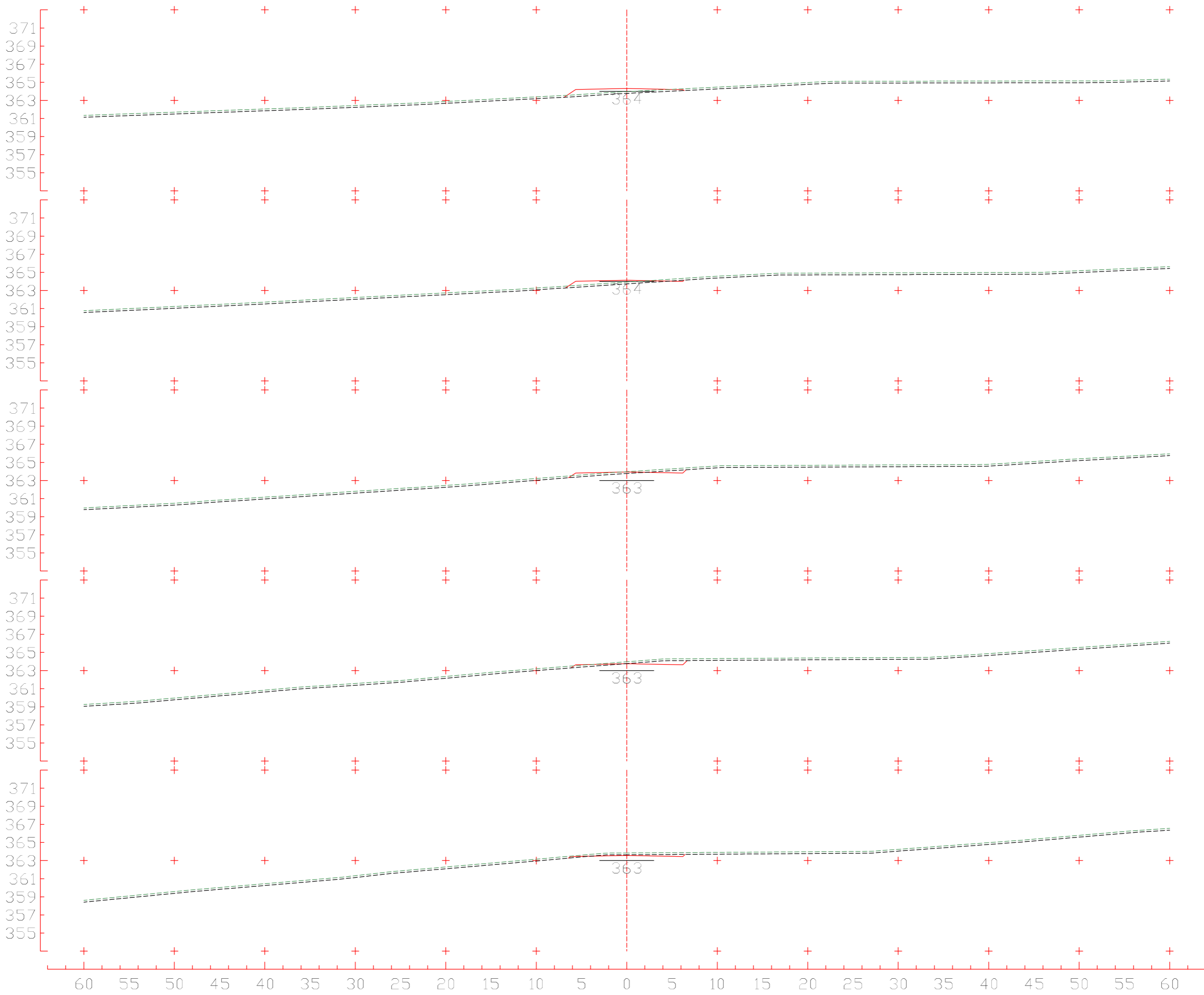
5+660
 CT 364,691 m
 CP 363,188 m

5+640
 CT 364,637 m
 CP 363,000 m

5+620
 CT 364,336 m
 CP 362,812 m

5+600
 CT 363,442 m
 CP 362,624 m

Eixo 1
 Escala 1:400



5+780
 CT 363,971 m
 CP 364,315 m

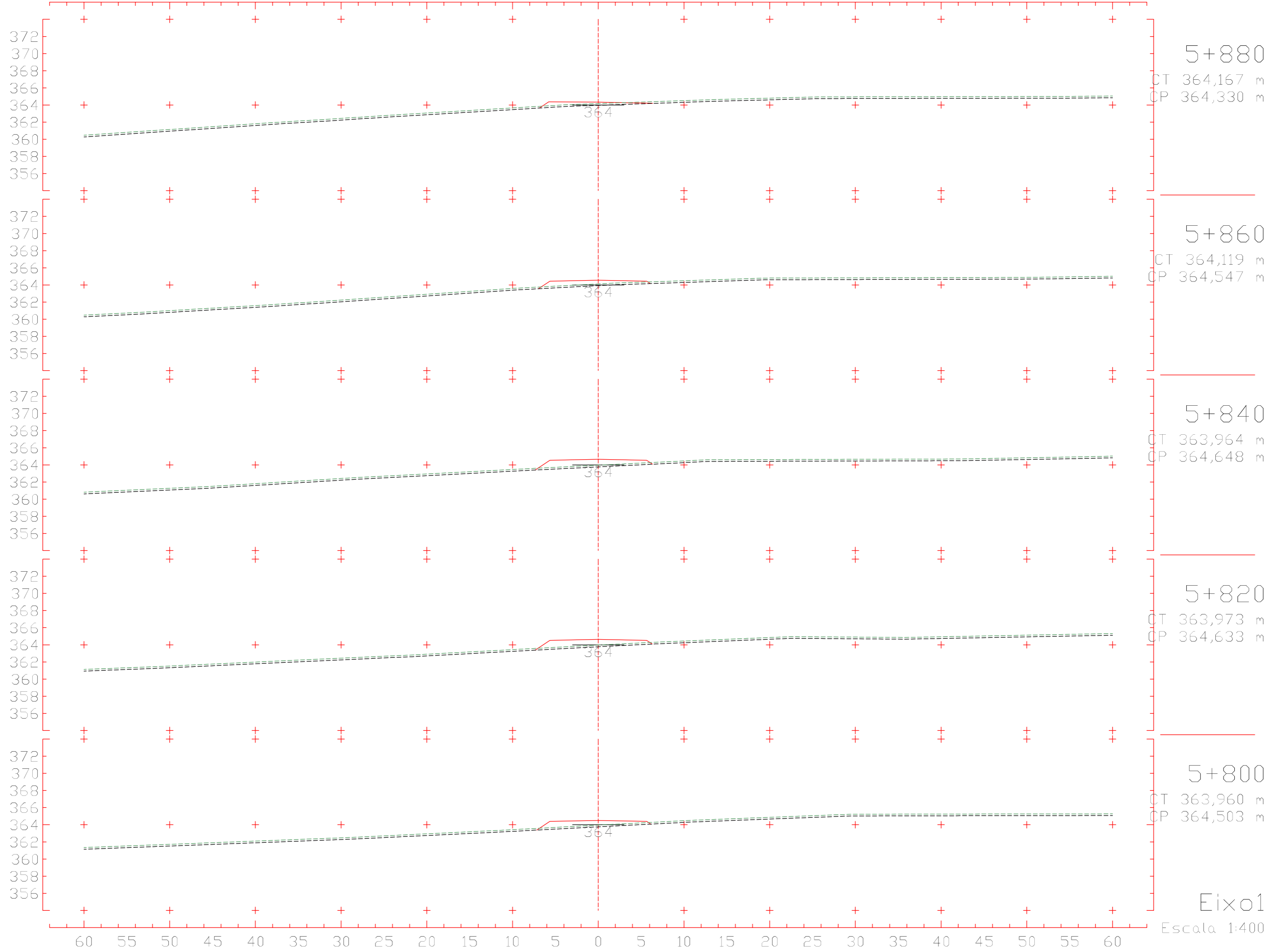
5+760
 CT 363,920 m
 CP 364,128 m

5+740
 CT 363,971 m
 CP 363,940 m

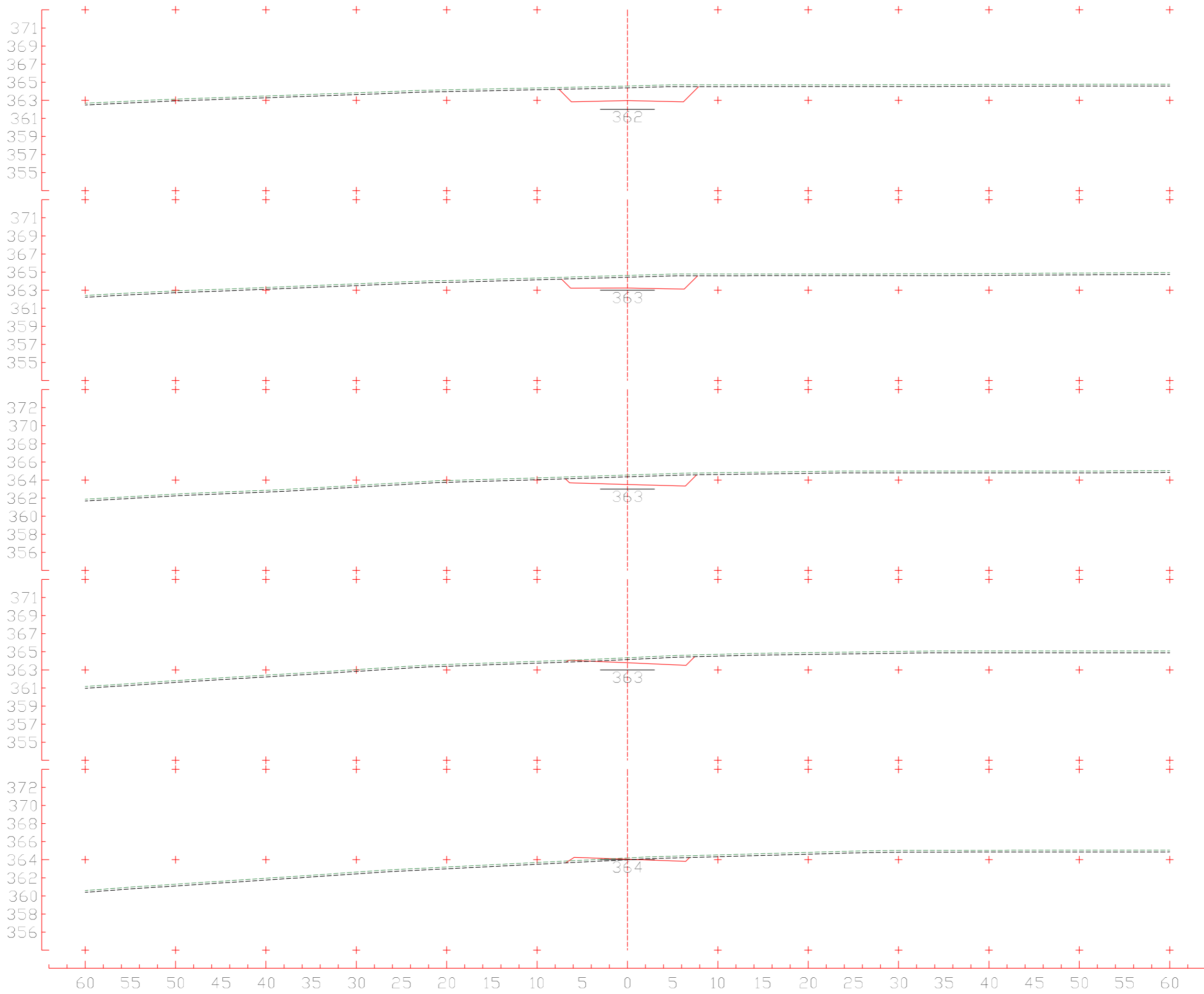
5+720
 CT 363,966 m
 CP 363,752 m

5+700
 CT 363,842 m
 CP 363,564 m

Eixo 01
 Escala 1:400



Eixoi
Escala 1:400



5+980
 CT 364,577 m
 CP 362,958 m

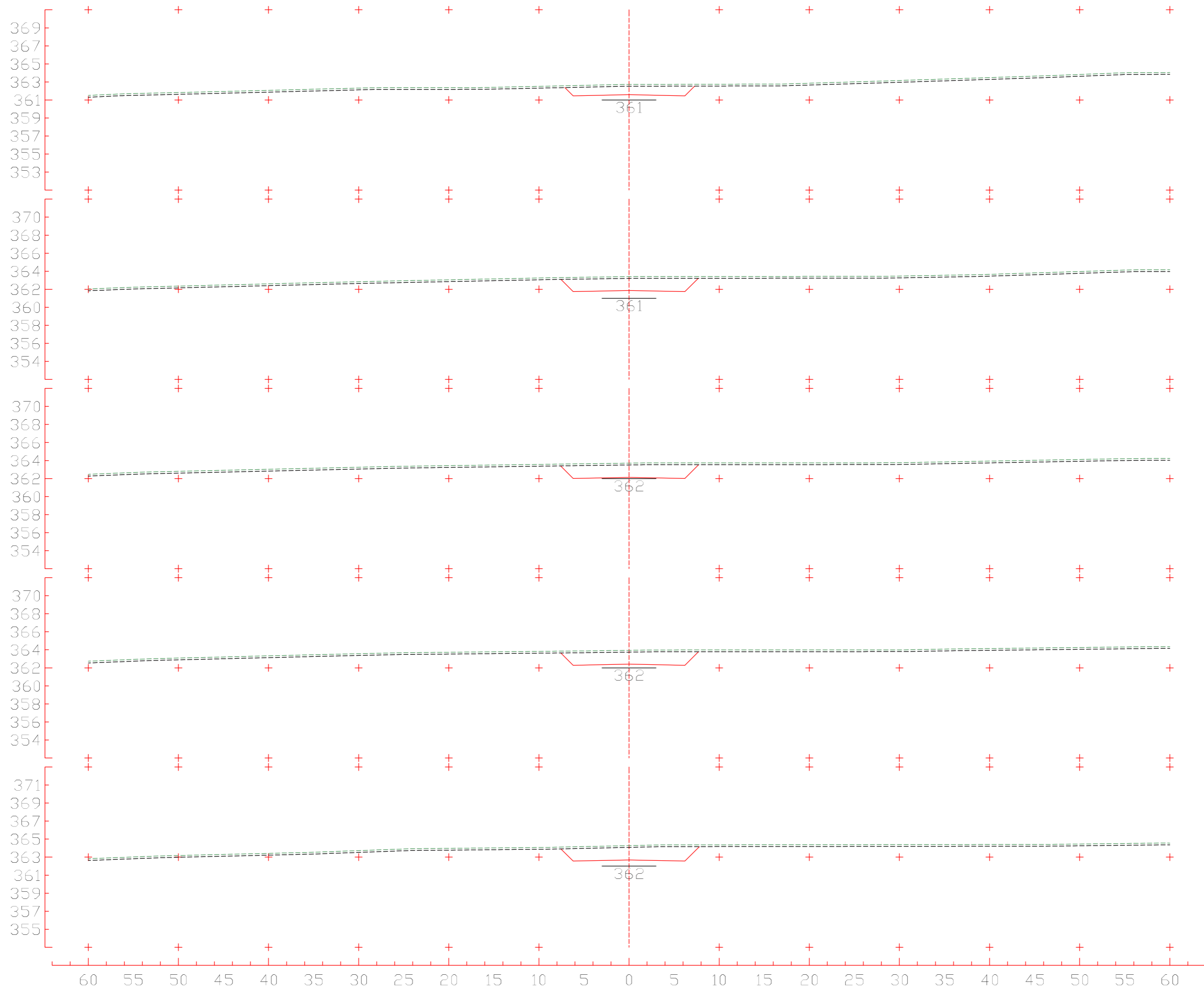
5+960
 CT 364,630 m
 CP 363,233 m

5+940
 CT 364,551 m
 CP 363,507 m

5+920
 CT 364,342 m
 CP 363,781 m

5+900
 CT 364,196 m
 CP 364,056 m

Eixo 01
 Escala 1:400



6+080
 CT 362,720 m
 CP 361,586 m

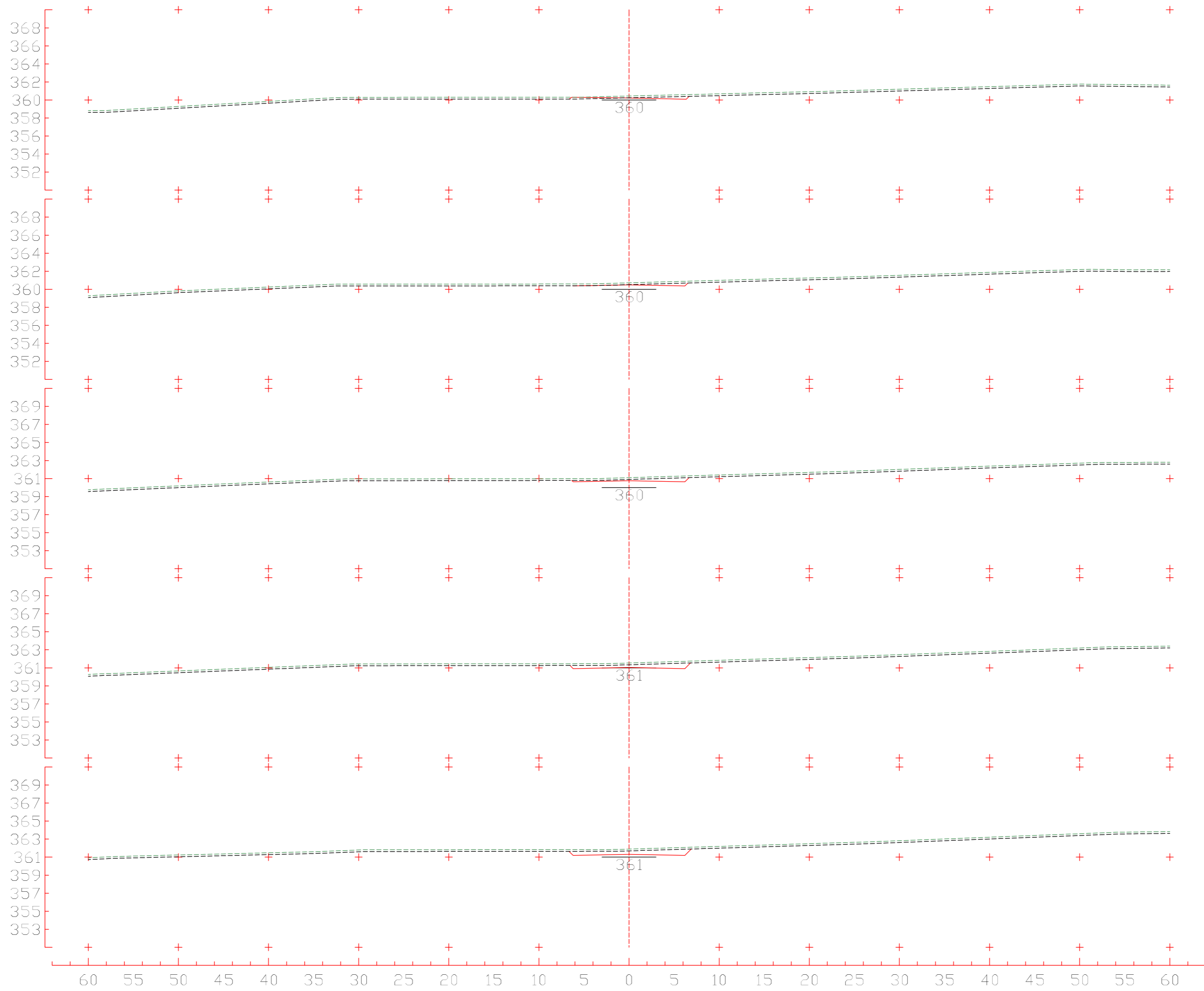
6+060
 CT 363,404 m
 CP 361,860 m

6+040
 CT 363,708 m
 CP 362,135 m

6+020
 CT 363,945 m
 CP 362,409 m

6+000
 CT 364,280 m
 CP 362,684 m

Eixo 1
 Escala 1:400



6+180
 CT 360,440 m
 CP 360,214 m

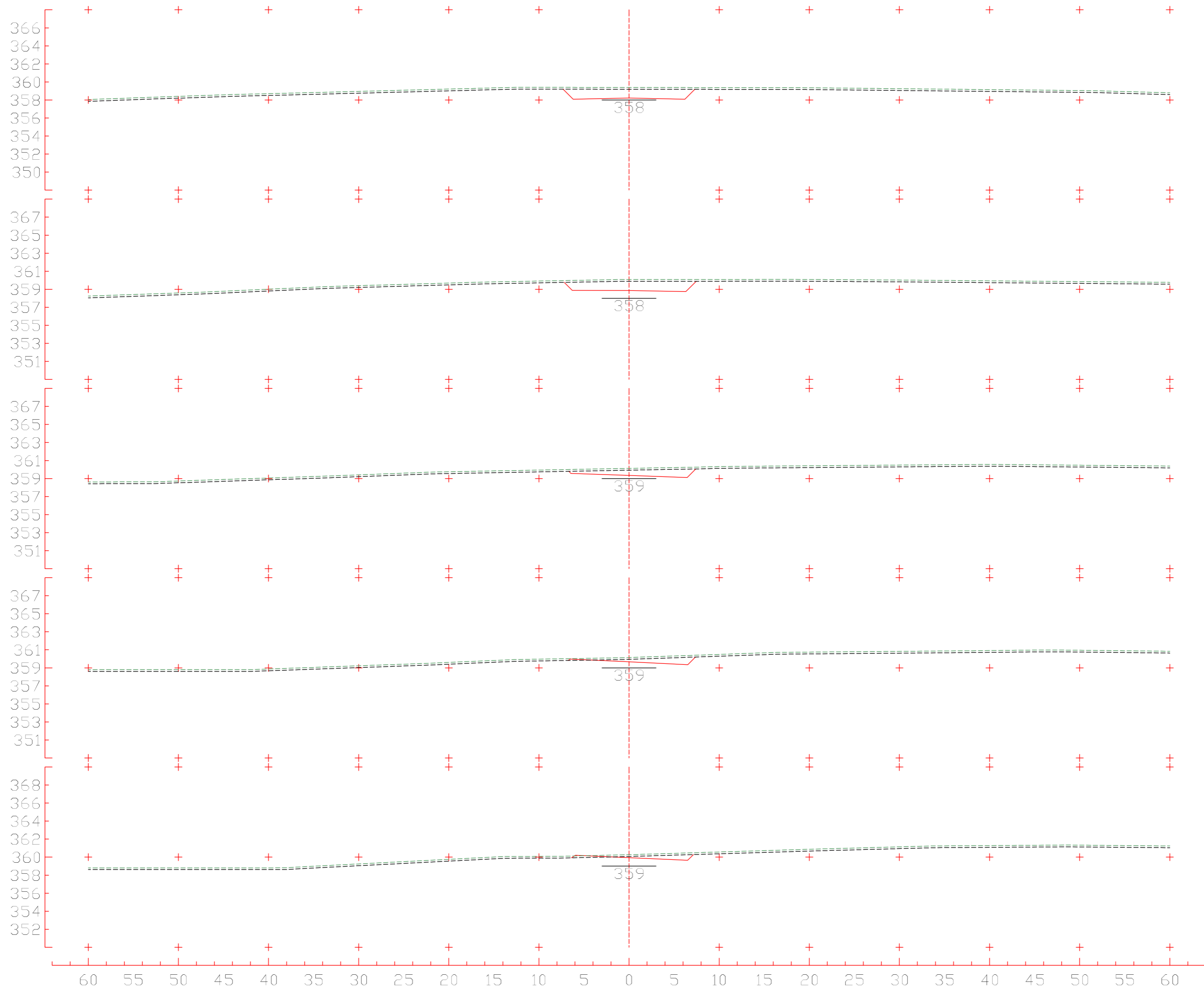
6+160
 CT 360,712 m
 CP 360,488 m

6+140
 CT 361,099 m
 CP 360,763 m

6+120
 CT 361,538 m
 CP 361,037 m

6+100
 CT 361,891 m
 CP 361,311 m

Eixo 01
 Escala 1:400



6+280
 CT 359,387 m
 CP 358,210 m

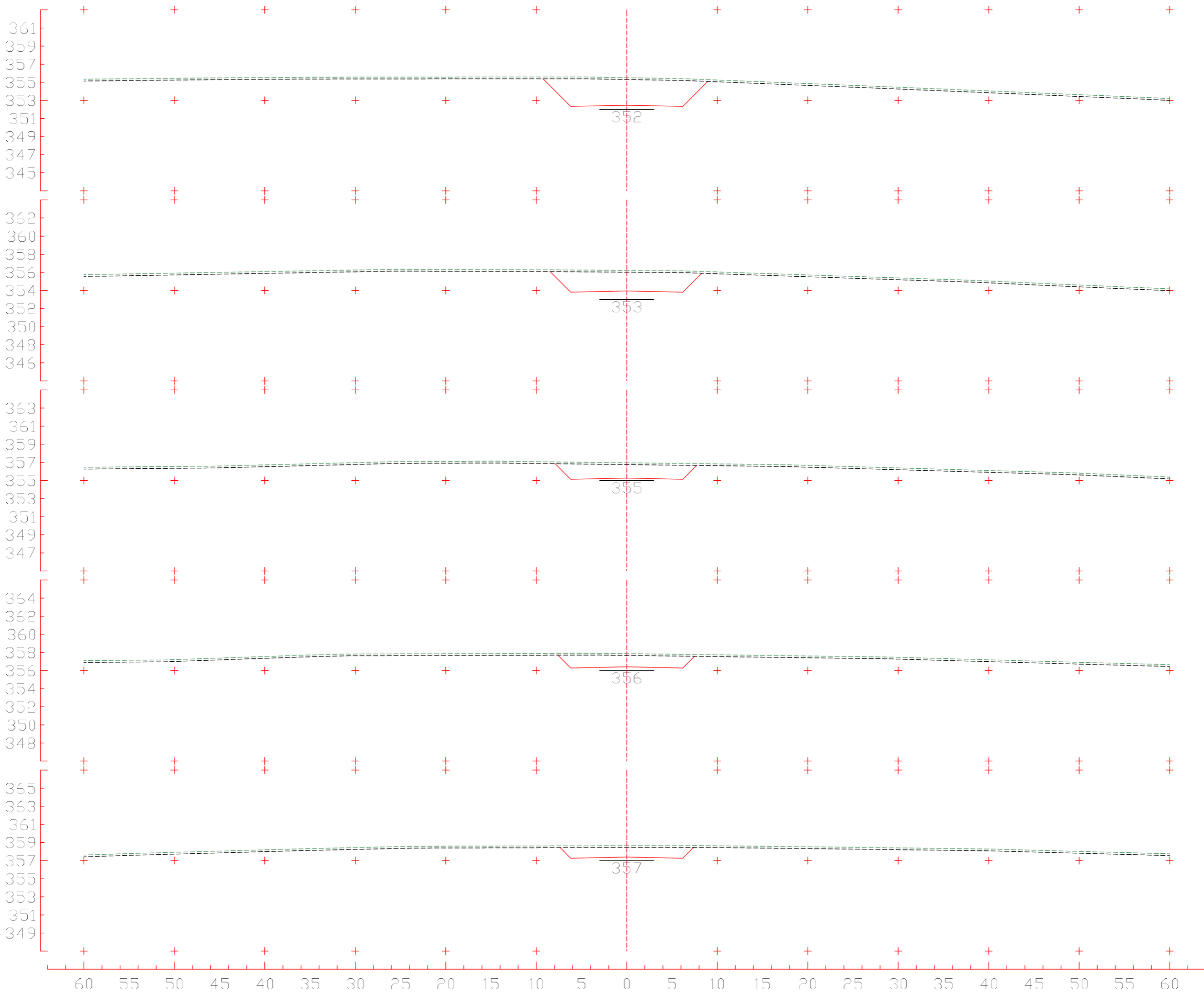
6+260
 CT 360,074 m
 CP 358,860 m

6+240
 CT 360,128 m
 CP 359,343 m

6+220
 CT 360,145 m
 CP 359,665 m

6+200
 CT 360,274 m
 CP 359,939 m

Eixo 01
 Escala 1:400



6+380
 CT 355,505 m
 CP 352,461 m

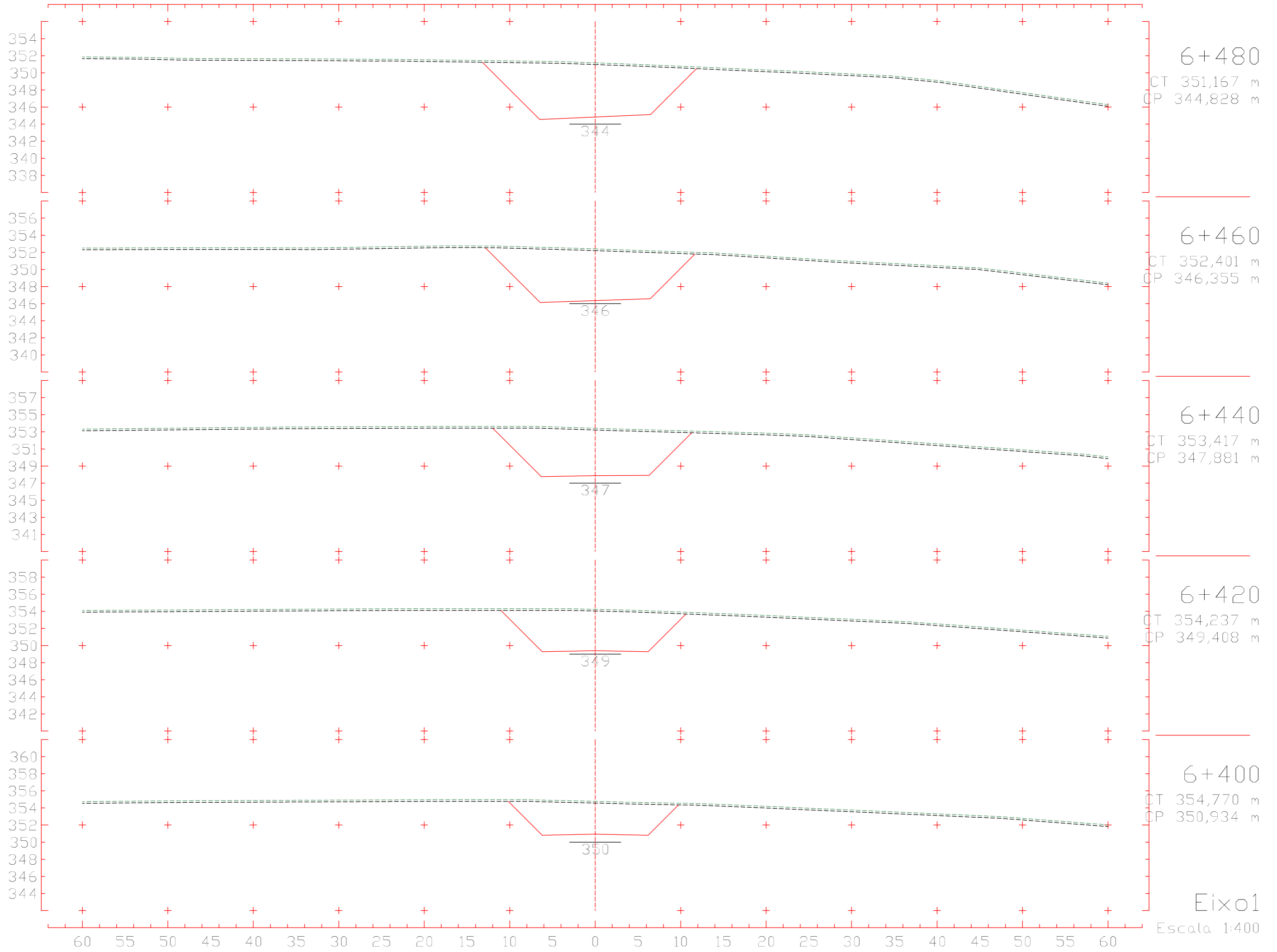
6+360
 CT 356,212 m
 CP 353,940 m

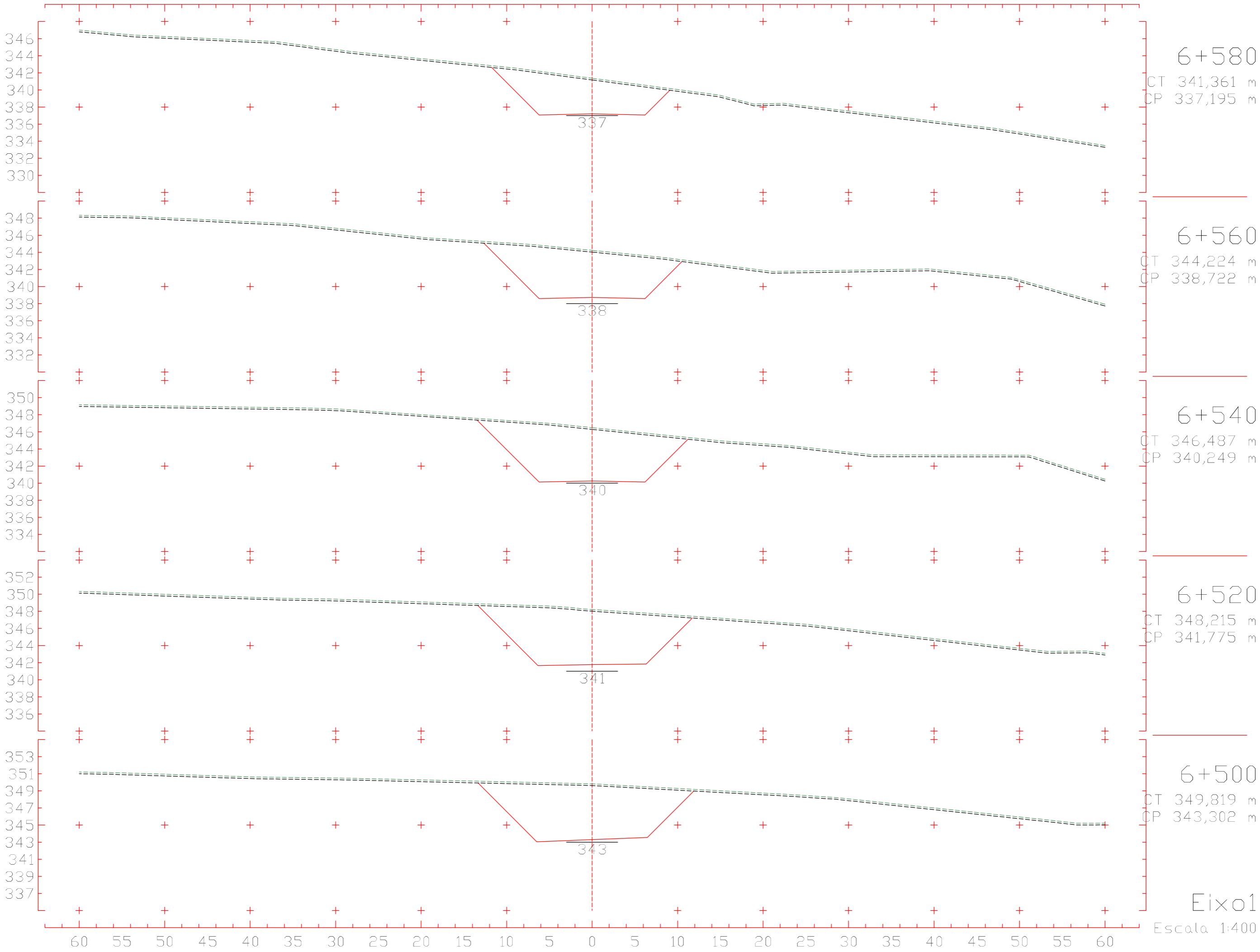
6+340
 CT 356,956 m
 CP 355,258 m

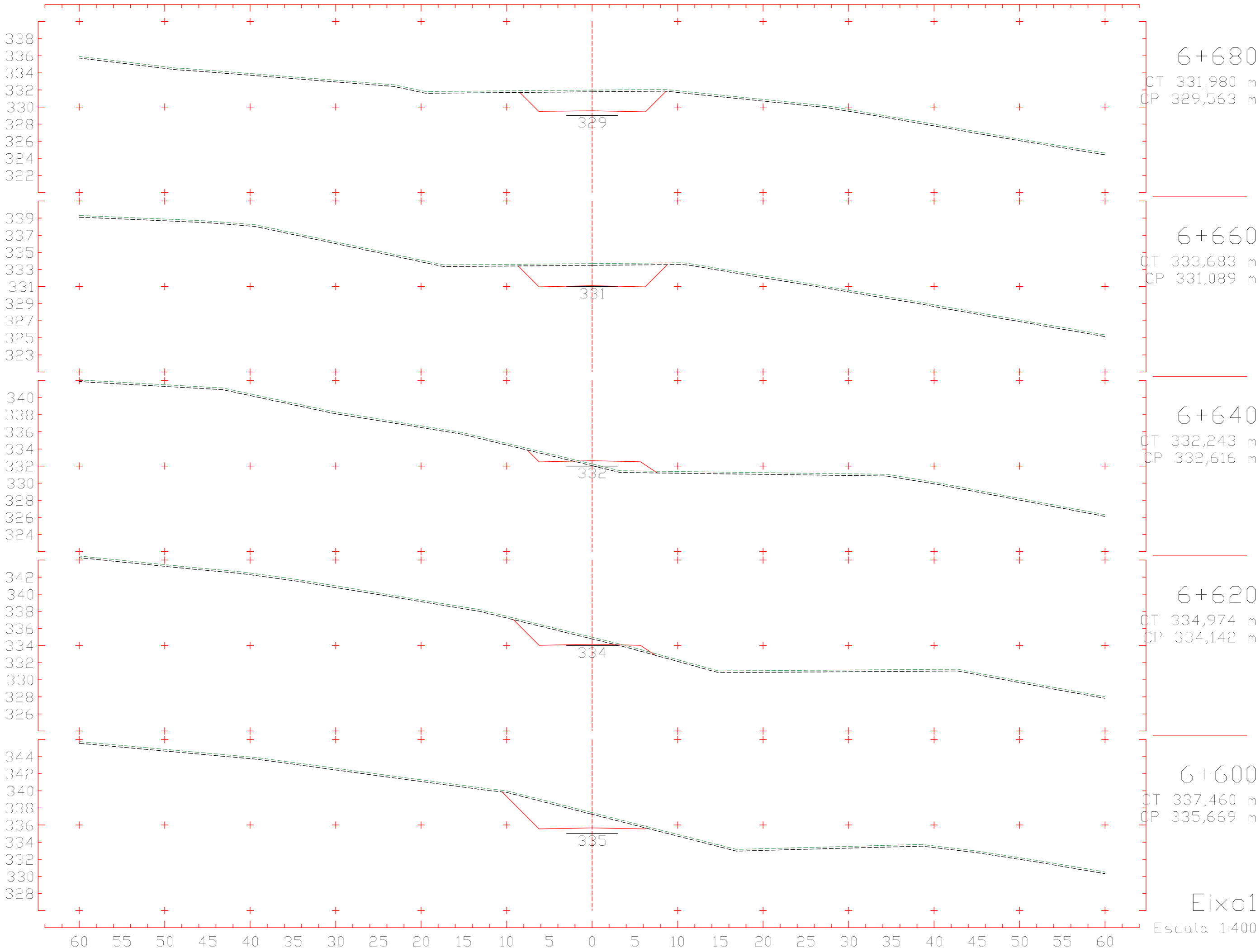
6+320
 CT 357,871 m
 CP 356,409 m

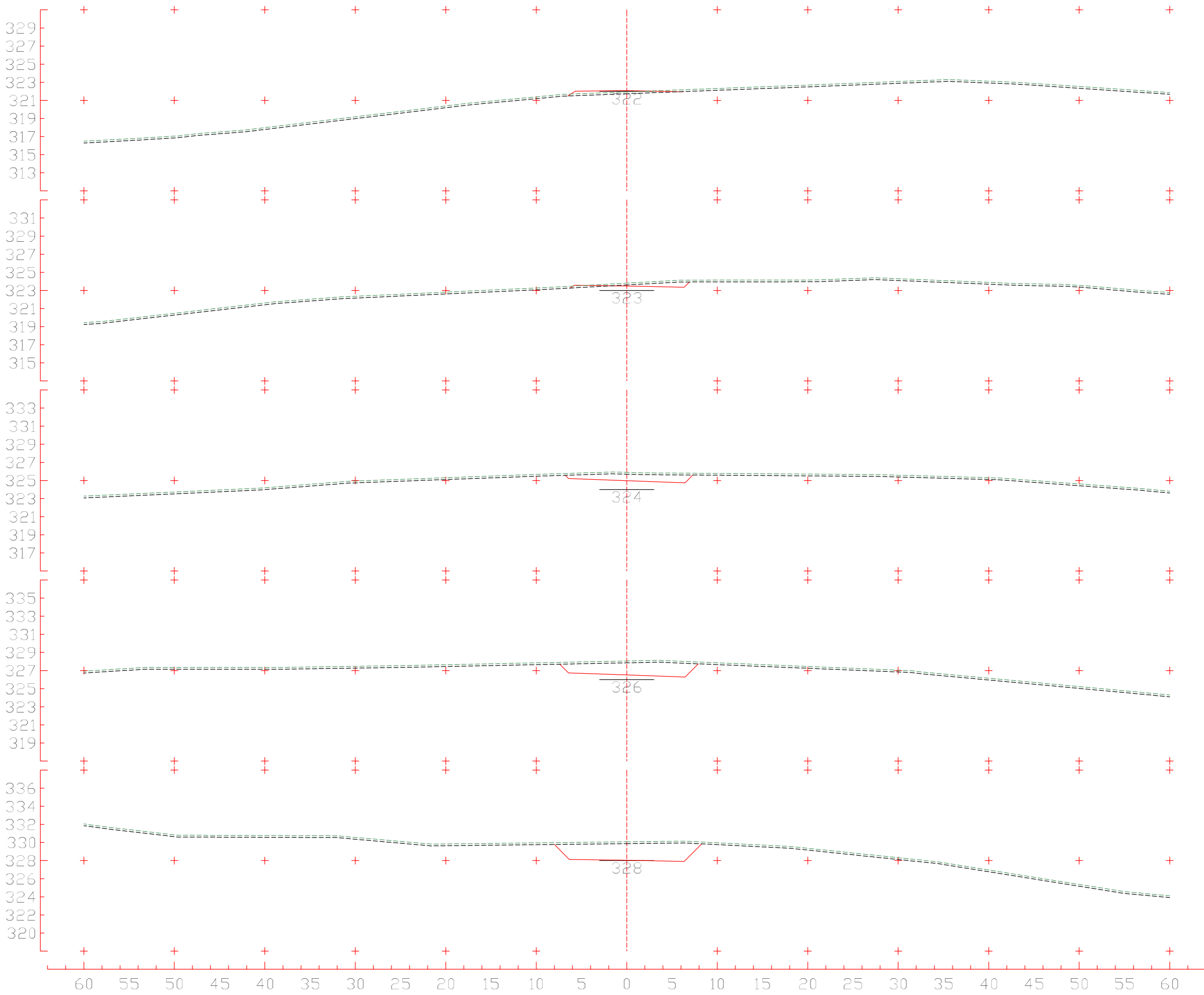
6+300
 CT 358,647 m
 CP 357,393 m

Eixo 01
 Escala 1:400









6+780
 CT 321,933 m
 CP 322,074 m

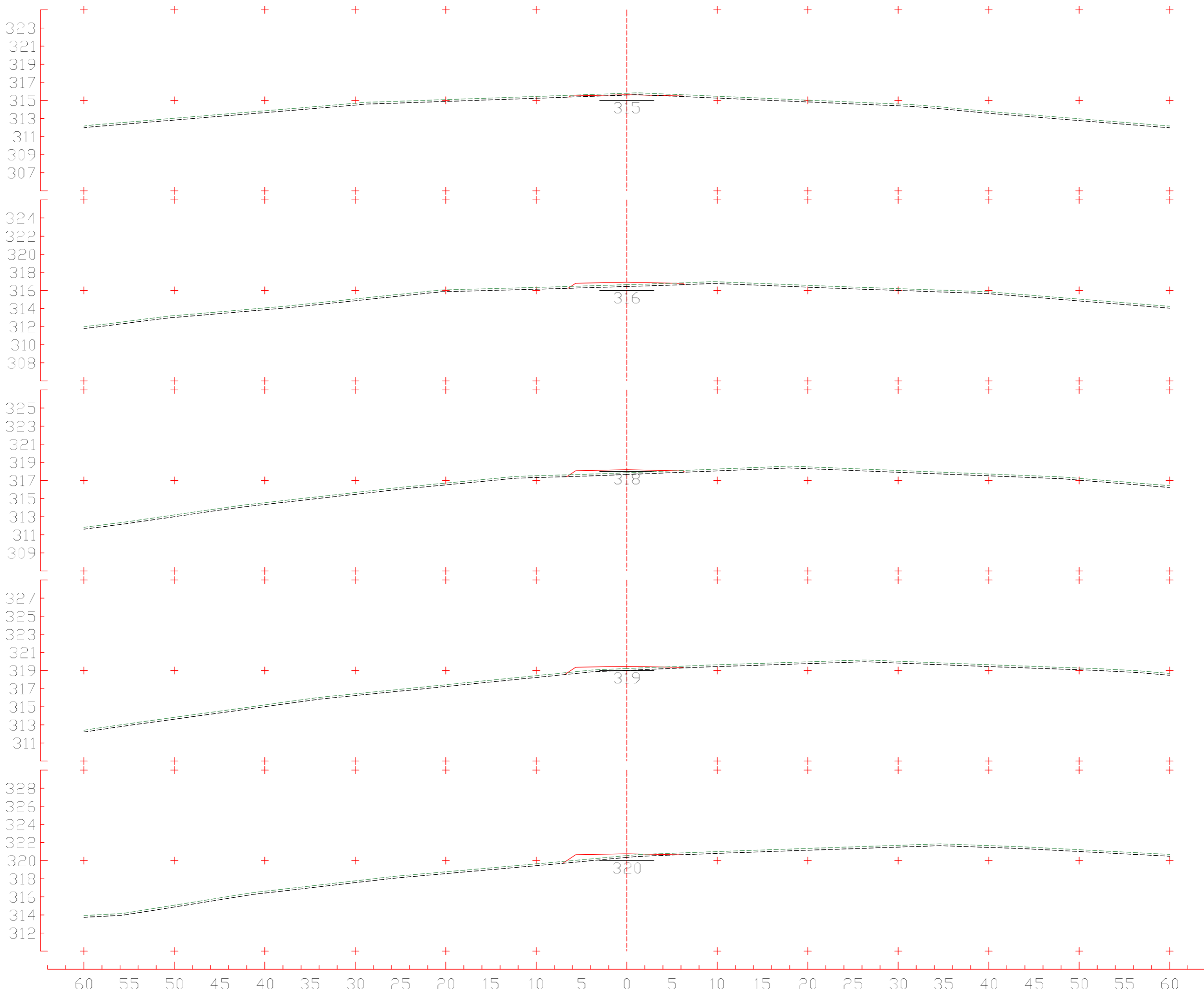
6+760
 CT 323,806 m
 CP 323,482 m

6+740
 CT 325,895 m
 CP 324,983 m

6+720
 CT 328,053 m
 CP 326,510 m

6+700
 CT 330,074 m
 CP 328,036 m

Eixo 01
 Escala 1:400



6+880
 CT 315,785 m
 CP 315,619 m

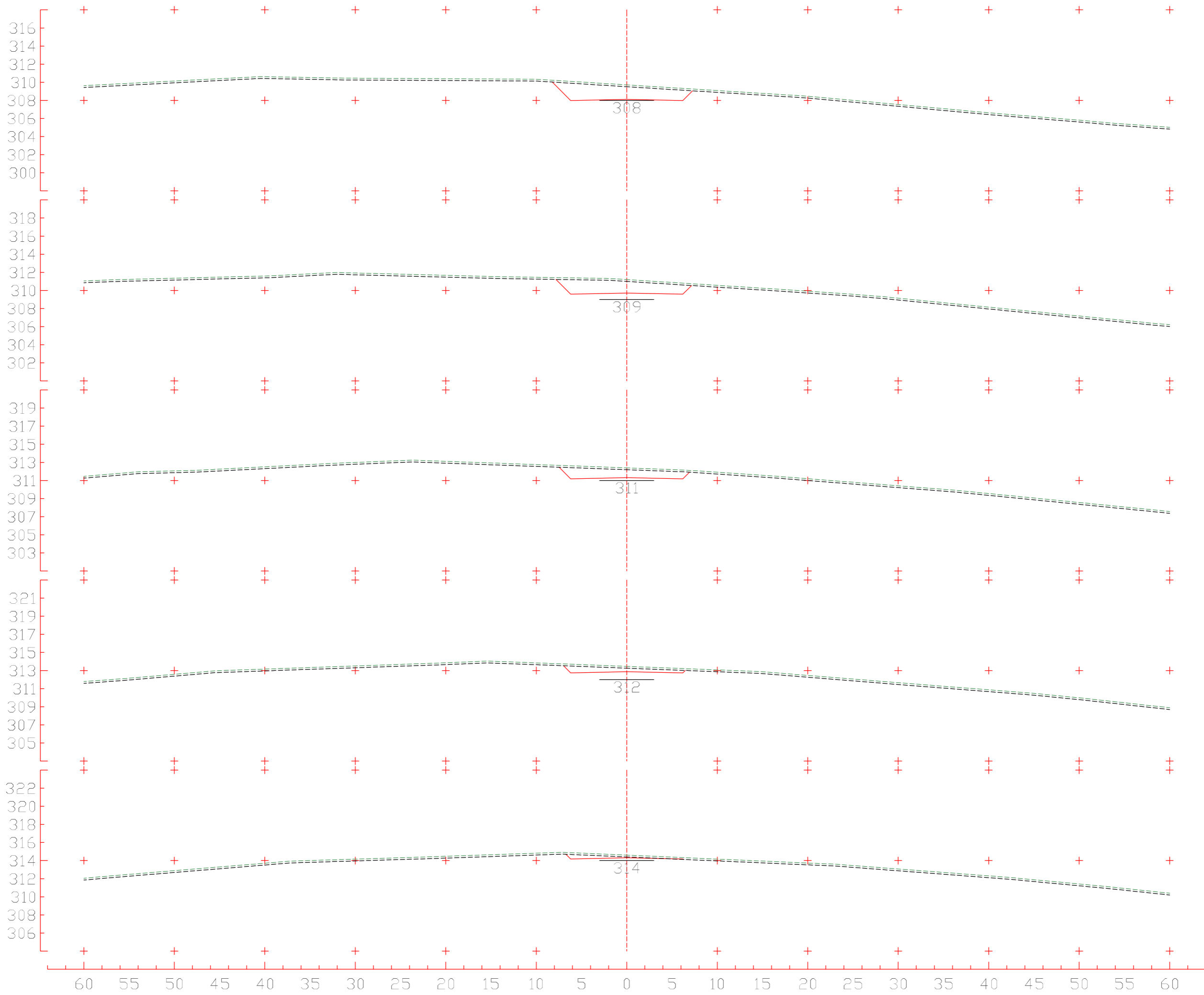
6+860
 CT 316,633 m
 CP 316,904 m

6+840
 CT 317,862 m
 CP 318,190 m

6+820
 CT 319,221 m
 CP 319,475 m

6+800
 CT 320,555 m
 CP 320,760 m

Eixo 01
 Escala 1:400



6+980
CT 309,709 m
CP 308,112 m

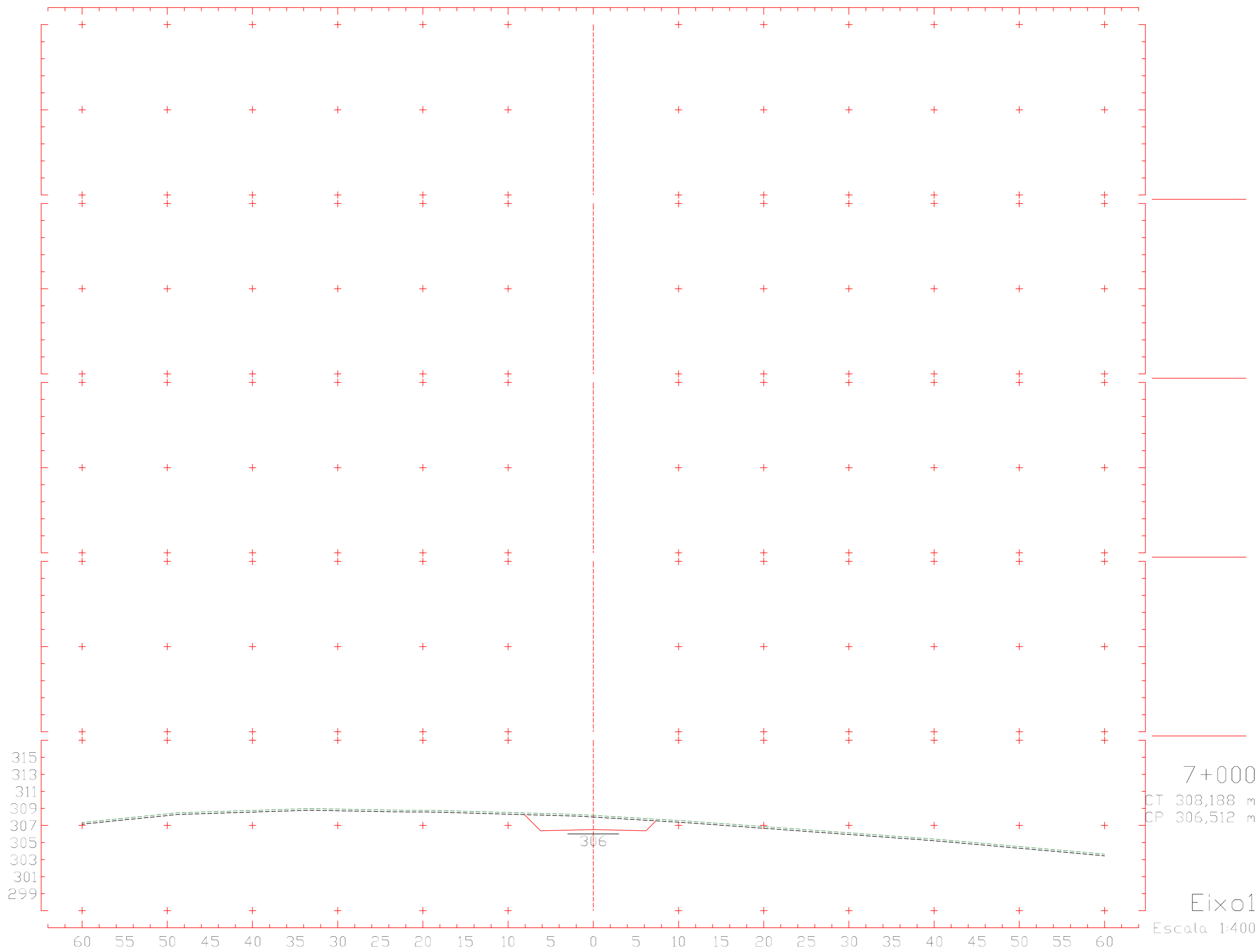
6+960
CT 311,196 m
CP 309,712 m

6+940
CT 312,389 m
CP 311,312 m

6+920
CT 313,458 m
CP 312,870 m

6+900
CT 314,603 m
CP 314,304 m

Eixo 01
Escala 1:400



3 PROJETO DE TERRAPLENAGEM

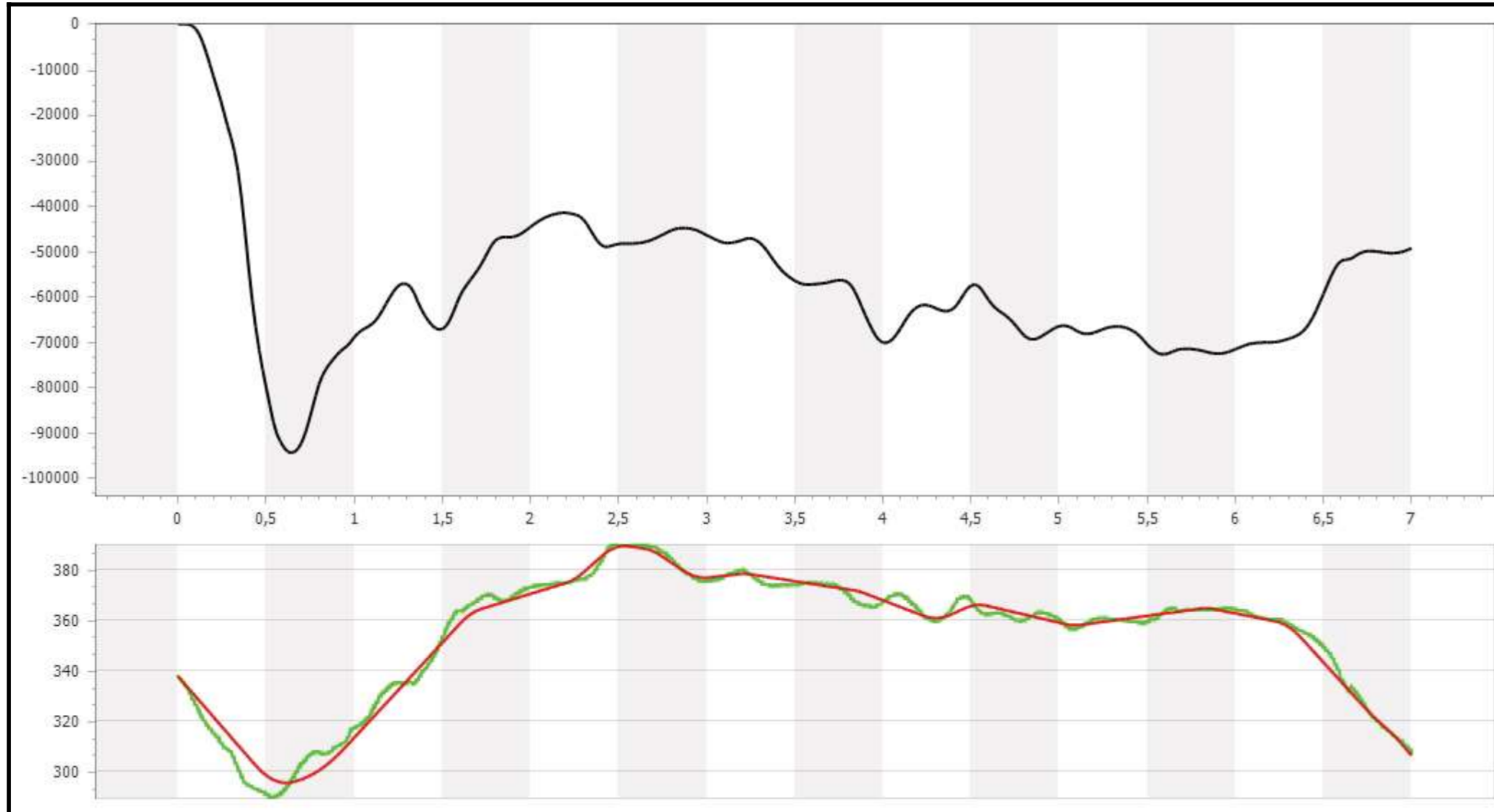
3.1 Diagrama de Massa

DIAGRAMA DE MASSAS (BRÜCKNER)

Rodovia: Grupo de Eixos 1
Trecho: Eixo1
Segmento: km: 0+000,00 ao km: 7+004,30

Homogeneização:
- Aterro Camada Superior: 1,000
- Aterro Camada Inferior : 1,000

- Corte 1ª Categoria: 1,300
- Corte 2ª Categoria: 1,000
- Corte 3ª Categoria: 0,800



3.2 Quadro de Origem e Destino

QUADRO DE ORIENTAÇÃO DA TERRAPLENAGEM

Rodovia: Grupo de Eixos 1	Homogeneização:	- Corte 1ª Categoria: 1,300	Vol. transp. : 208012,91m³
Trecho: Eixo1	- Aterro Camada Superior: 1,000	- Corte 2ª Categoria: 1,000	Momento tot.: 134006,66m³.m
Segmento: km: 0+000,00 ao km: 7+004,30	- Aterro Camada Inferior : 1,000	- Corte 3ª Categoria: 0,800	DMT : 0,644km

ORIGEM								DESTINO							TRANSPORTE			OBSERVAÇÕES		
IDENTIFICAÇÃO			LOCALIZAÇÃO			VOLUMES (m3)		IDENTIFICAÇÃO			LOCALIZAÇÃO			VOLUME	DIST.	VOL.	MOM. DE			
ESPECIFICAÇÃO		FATOR	POSICIONAMENTO			DM	GEO.	HOMOGENEIZADO		ESPECIFICAÇÃO		POSICIONAMENTO			DM	GEO.	TRANSP.		COMP.	TRANSP.
ID	TIPO	HOMO.	INÍCIO	CM	FIM	(km)	TOTAL	TOTAL	PARC.	ID	TIPO	INÍCIO	CM	FIM	(km)	TOTAL	(km)		(m³)	(m³ x km)
EC-01	C1ª	1,30	0+200	0+360	0+380	0,200	64268,91	49437,62		A-001	AI	0+050	0+370	0+630		83138,00	0,210	64268,91	13496,471	
C-001	C1ª	1,30	0+000	0+020	0+050		78,00	60,00	60,00	A-001	AI	0+050	0+370	0+630		11519,00	0,350	78,00	27,300	
C-002	C1ª	1,30	0+630	0+910	1+310		48708,00	37467,69		A-001	AI	0+050	0+370	0+630		11519,00	0,540	43732,49	23615,545	
									33640,38	A-001	AI	0+050	0+370	0+630		11519,00	0,560	4975,51	2786,286	
									3827,32	A-001	AS	0+000	0+350	0+650		11519,00	0,560	4975,51	2786,286	
C-003	C1ª	1,30	1+470	1+780	2+210		17556,00	13504,62		A-001	AS	0+000	0+350	0+650		11519,00	1,430	9999,19	14298,842	
									7691,68	A-002	AI	1+270	1+370	1+490		7891,00	0,410	7556,81	3098,292	
									5812,93	A-002	AI	1+270	1+370	1+490		7891,00	0,410	7556,81	3098,292	
C-003	C2ª	1,00	1+490	1+650	1+830		4945,00	4945,00		A-002	AI	1+270	1+370	1+490		2447,00	0,280	2078,07	581,859	
									2078,07	A-002	AS	1+270	1+380	1+490		2447,00	0,270	2447,00	660,690	
									2447,00	A-002	AS	1+270	1+380	1+490		2447,00	0,270	2447,00	660,690	
									18,00	A-003	AI	1+850	1+860	1+890		18,00	0,210	18,00	3,780	
									153,00	A-003	AS	1+830	1+860	1+910		153,00	0,210	153,00	32,130	
									248,93	A-004	AI	2+210	2+340	2+430		5345,00	0,690	248,93	171,762	
C-003	C2ª	1,00	1+910	2+000	2+110		804,00	804,00		A-004	AS	2+170	2+320	2+430		2273,00	0,320	804,00	257,280	
									804,00	A-004	AS	2+170	2+320	2+430		2273,00	0,320	804,00	257,280	
C-003	C3ª	0,80	1+510	1+640	1+810		5406,00	6757,50		A-004	AI	2+210	2+340	2+430		1537,00	0,700	4076,86	2853,799	
									5096,07	A-006	AI	2+910	3+000	3+110		1537,00	1,360	1229,60	1672,256	
									1537,00	A-006	AI	2+910	3+000	3+110		1537,00	1,360	1229,60	1672,256	
									124,43	A-007	AI	3+250	3+380	3+550		7087,00	1,740	99,54	173,208	
C-003	C3ª	0,80	1+950	1+990	2+010		5,00	6,25		A-007	AI	3+250	3+380	3+550		7087,00	1,740	99,54	173,208	
									6,25	A-007	AI	3+250	3+380	3+550		7087,00	1,390	5,00	6,950	
C-004	C1ª	1,30	2+430	2+670	2+870		5524,00	4249,23		A-004	AS	2+170	2+320	2+430		1816,00	0,350	1909,70	668,395	
									1469,00	A-005	AS	2+510	2+530	2+570		56,00	0,140	72,80	10,192	
									56,00	A-005	AS	2+510	2+530	2+570		56,00	0,140	72,80	10,192	
									1816,00	A-006	AS	2+870	3+000	3+130		1816,00	0,330	2360,80	779,064	
									908,23	A-007	AI	3+250	3+380	3+550		1816,00	0,710	1180,70	838,297	
C-004	C2ª	1,00	2+750	2+760	2+790		43,00	43,00		A-007	AI	3+250	3+380	3+550		1816,00	0,710	1180,70	838,297	
									43,00	A-007	AI	3+250	3+380	3+550		1816,00	0,620	43,00	26,660	
C-005	C1ª	1,30	3+110	3+180	3+250		1446,00	1112,31		A-007	AI	3+250	3+380	3+550		1816,00	0,200	1446,00	289,200	
									1112,31	A-007	AI	3+250	3+380	3+550		1816,00	0,200	1446,00	289,200	
C-006	C1ª	1,30	3+550	3+670	3+750		1327,00	1020,77		A-007	AI	3+250	3+380	3+550		1816,00	0,290	1327,00	384,830	
									1020,77	A-007	AI	3+250	3+380	3+550		1816,00	0,290	1327,00	384,830	
C-007	C1ª	1,30	4+010	4+110	4+250		10987,00	8451,54		A-007	AI	3+250	3+380	3+550		1816,00	0,730	5033,62	3674,539	
									3872,01	A-007	AS	3+230	3+400	3+590		3172,00	0,710	4123,60	2927,756	
									3172,00	A-007	AS	3+230	3+400	3+590		3172,00	0,710	4123,60	2927,756	
									1407,53	A-008	AI	3+770	3+890	4+010		10929,00	0,220	1829,78	402,553	
C-008	C1ª	1,30	4+350	4+440	4+530		7731,00	5946,92		A-008	AI	3+770	3+890	4+010		10929,00	0,550	7731,00	4252,050	
									5946,92	A-008	AI	3+770	3+890	4+010		10929,00	0,550	7731,00	4252,050	
C-009	C1ª	1,30	4+850	4+930	5+030		4040,00	3107,69		A-008	AI	3+770	3+890	4+010		10929,00	1,040	4040,00	4201,600	
									3107,69	A-008	AI	3+770	3+890	4+010		10929,00	1,040	4040,00	4201,600	

QUADRO DE ORIENTAÇÃO DA TERRAPLENAGEM

Rodovia: Grupo de Eixos 1	Homogeneização:	- Corte 1ª Categoria: 1,300	Vol. transp. : 208012,91m³
Trecho: Eixo1	- Aterro Camada Superior: 1,000	- Corte 2ª Categoria: 1,000	Momento tot.: 134006,66m³.m
Segmento: km: 0+000,00 ao km: 7+004,30	- Aterro Camada Inferior : 1,000	- Corte 3ª Categoria: 0,800	DMT : 0,644km

ORIGEM						DESTINO						TRANSPORTE			OBSERVAÇÕES					
IDENTIFICAÇÃO		LOCALIZAÇÃO			VOLUMES (m3)			IDENTIFICAÇÃO		LOCALIZAÇÃO			VOLUME	DIST.		VOL.	MOM. DE			
ESPECIFICAÇÃO		FATOR	POSICIONAMENTO			DM	GEO.	HOMOGENEIZADO		ESPECIFICAÇÃO		POSICIONAMENTO				DM	GEO.	TRANSP.	COMP.	TRANSP.
ID	TIPO	HOMO.	INÍCIO	CM	FIM	(km)	TOTAL	TOTAL	PARC.	ID	TIPO	INÍCIO	CM	FIM		(km)	TOTAL	(km)	(m³)	(m³ x km)
C-010	C1ª	1,30	5+150	5+230	5+350		2198,00	1690,77												
								466,86		A-008	AI	3+770	3+890	4+010			1,340	606,92	813,266	
								1223,91		A-008	AS	3+750	3+880	4+010		2955,00	1,350	1591,08	2147,965	
C-011	C1ª	1,30	5+590	5+640	5+770		1694,00	1303,08												
								1303,08		A-008	AS	3+750	3+880	4+010			1,760	1694,00	2981,440	
C-012	C1ª	1,30	5+890	6+440	6+770		29804,00	22926,15												
								428,01		A-008	AS	3+750	3+880	4+010			2,560	556,42	1424,422	
								578,00		A-009	AI	4+230	4+290	4+350		578,00	2,150	751,40	1615,510	
								887,00		A-009	AS	4+230	4+290	4+370		887,00	2,150	1153,10	2479,165	
								8737,00		A-010	AI	4+530	4+670	4+830		8737,00	1,770	11358,10	20103,837	
								3418,00		A-010	AS	4+510	4+680	4+850		3418,00	1,760	4443,40	7820,384	
								886,00		A-011	AI	5+030	5+080	5+150		886,00	1,360	1151,80	1566,448	
								1000,00		A-011	AS	5+030	5+080	5+170		1000,00	1,360	1300,00	1768,000	
								3965,00		A-012	AI	5+350	5+480	5+570		3965,00	0,960	5154,50	4948,320	
								2264,00		A-012	AS	5+310	5+460	5+590		2264,00	0,980	2943,20	2884,336	
								166,00		A-013	AI	5+750	5+820	5+890		166,00	0,620	215,80	133,796	
								597,14		A-013	AS	5+690	5+810	5+930		976,00	0,630	776,28	489,060	
C-013	C1ª	1,30	6+870	6+870	7+004		1448,00	1113,85												
								378,86		A-013	AS	5+690	5+810	5+930			1,060	492,52	522,066	
								28,00		A-014	AS	6+150	6+190	6+230		28,00	0,680	36,40	24,752	
								62,00		A-015	AI	6+610	6+640	6+650		62,00	0,230	80,60	18,538	
								128,00		A-015	AS	6+610	6+630	6+650		128,00	0,240	166,40	39,936	
								9,00		A-016	AI	6+790	6+800	6+850		9,00	0,070	11,70	0,819	
								507,99		A-016	AS	6+750	6+820	6+910		508,00	0,050	660,38	33,019	

3.3 Esquema Linear de Distribuição dos Materiais

EC-01(0,200km) 64268,91m³/49437,62m³
 [64268,91m³→A-001(AI)]

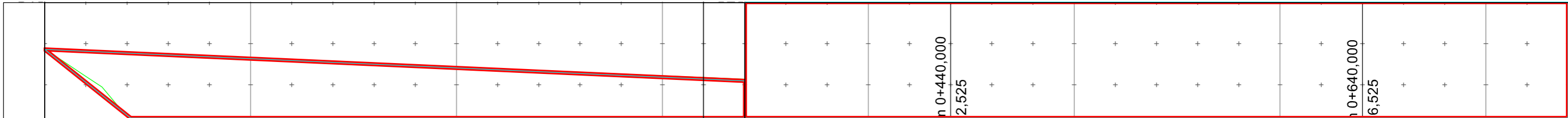
C-001(C1^a) 78,00m³/60,00m³
 [78,00m³→A-001(AI)]

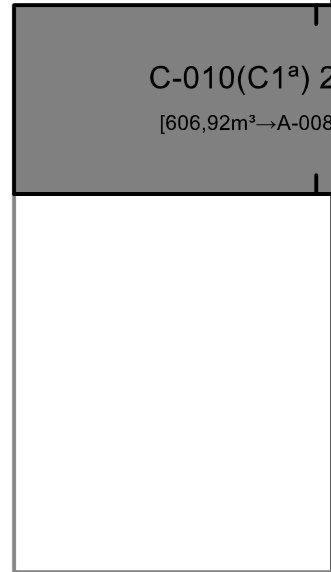
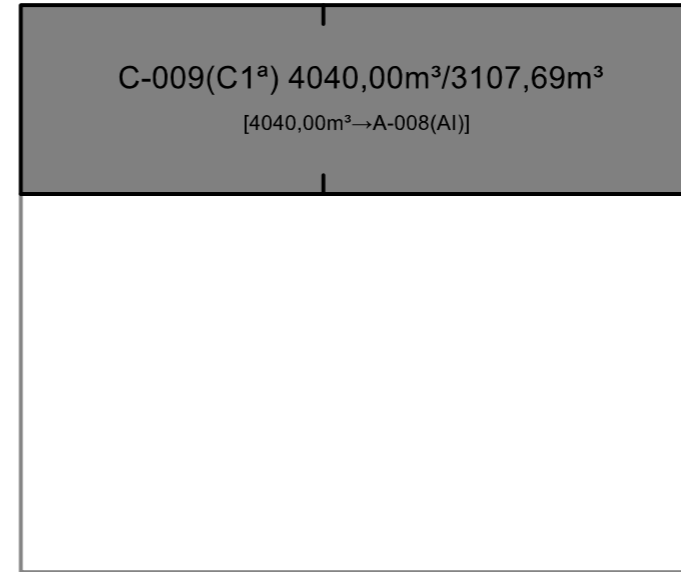
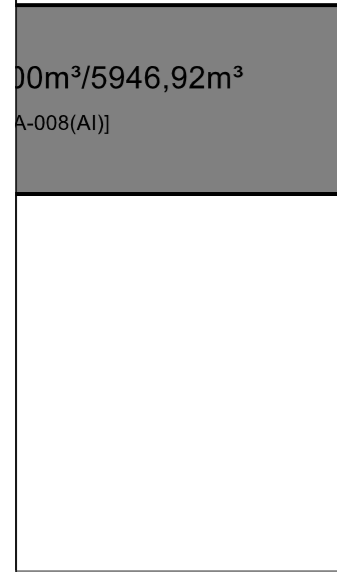
[Unreadable text in grey box]

0+000 0+100 0+200 0+300 0+400 0+500 0+600 0+700

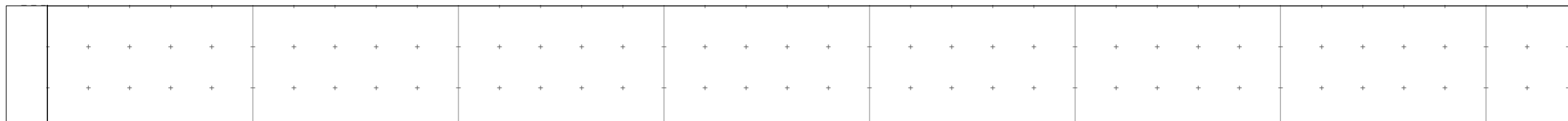
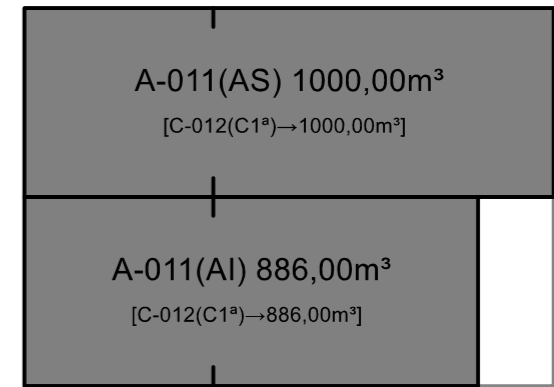
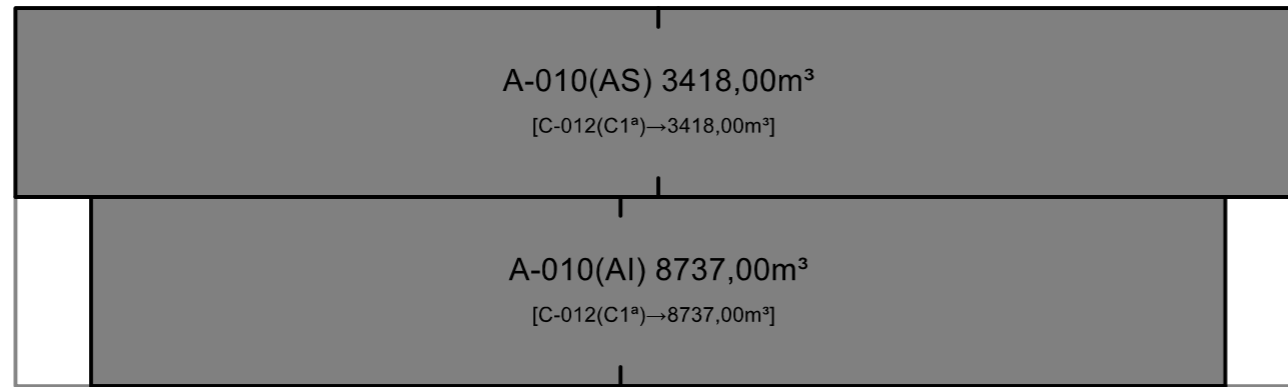
A-001(AS) 11519,00m³
 [C-002(C1^a)→3827,32m³] [C-003(C1^a)→7691,68m³]

A-001(AI) 83138,00m³
 [C-001(C1^a)→60,00m³] [EC-01(C1^a)→49437,62m³] [C-002(C1^a)→33640,38m³]





4+500 4+600 4+700 4+800 4+900 5+000 5+100 5+200



C-012(C1^a) 29804,00m³/22926,15m³

[556,42m³→A-008(AS)] [751,40m³→A-009(AI)] [1153,10m³→A-009(AS)] [11358,10m³→A-010(AI)] [4443,40m³→A-010(AS)] [1151,80m³→A-011(AI)] [1300,00m³→A-011(AS)] [5154,50m³→A-012(AI)] [2943,20m³→A-012(AS)] [215,80m³→A-013(AI)] [776,28m³→A-013(AS)]

6+000

6+100

6+200

6+300

6+400

6+500

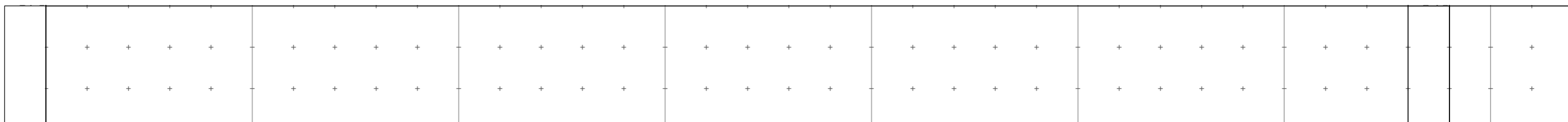
6+600

6+700

A-014(AS) 28,00m³
[C-013(C1^a)→28,00m³]

A-015(AS) 128,00m³
[C-013(C1^a)→128,00m³]

A-015(AI) 62,00m³
[C-013(C1^a)→62,00m³]



7+500