

MINISTRY OF FORESTS AND RANGE

BC TIMBER SALES

OKANAGAN COLUMBIA FOREST DISTRICT

BRANCH 17.6, 17.6A, 17.6D, 17.6E, 17.6F & 19
LEVEL 2 GEOMETRIC ROAD DESIGN REPORT
REVISION 1

PREPARED FOR:



PREPARED BY:



APRIL 12, 2011

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1.0 INTRODUCTION

The purpose of this report and associated designs are to prepare and present road alignments (both horizontal and vertical) and earthworks volume estimations for the sections of new construction. The report will also identify concerns that may affect road construction along the designed road sections. In total, approximately 5,392m of geometric road design has been completed as summarized in Table 1 below.

Table 1. Designed Road Sections

Road Name	Start		End		Section Length (m)
	Index #	Road Eng P-line Station (m)	Index #	Road Eng P-line Station (m)	
Branch 17.6					
New Construction	1	0+000	149	3+017	3,017
Branch 17.6A					
New Construction	1	0+000	82	1+271	1,271
Branch 17.6D					
New Construction	1	0+000	54	0+874	874
Branch 17.6E					
New Construction	1	0+000	5	0+085	85
Branch 17.6F					
New Construction	1	0+000	5	0+070	70
Branch 19					
New Construction	1	0+000	5	0+075	75
Total					5,392

Forsite Engineering & Geoscience Ltd.

October 16, 2009

1.1 AVAILABLE INFORMATION

The following is a list of the information used by Forsite Engineering & Geoscience Ltd. (Forsite) to complete the designs.

- 1) Road relocation reconnaissance and p-line location completed by Forsite Consultants Ltd.
- 2) Road traverses completed by Forsite Consultants Ltd
- 3) Terrain Stability Assessment completed by Forsite Engineering & Geoscience Ltd.

1.2 LIMITATIONS OF THE DESIGN

The following are limitations of the design which are meant to identify possible sources of error. Forsite does not assume responsibility for omissions in the design that are a result of the limitations summarized below.

- 1) The field surveys conducted along the route (p-line) were performed by Forsite Consultants Ltd crews. The accuracy of the side slope data, road alignments, and ultimately the design, is controlled by the inherent inaccuracies of the survey equipment used.
- 2) Cut and fill slope geometry, earthwork volume estimates are determined based on the side slope information and rock percent estimates and the soil types and characteristics noted in the field by the layout and traverse crews during road traverse. Cut and fill slope geometry for this project was determined based on the soil types and characteristics noted in the field by the field traverse crew. Actual subsurface conditions revealed during the road construction phase of the project may vary

from the estimated conditions that the geometric design is based upon. Variations in subsurface conditions may affect the attainable cut and fill slope angles. This will in turn influence the actual volumes excavated during road construction.

- 3) The successful completion of the road construction phase of the project depends on the skill of both the road construction crew and the construction supervision. Proper culvert installation, adherence to proposed road alignments, and proper drainage ditch construction are among the most important factors influencing the outcome of the project. It is imperative that culverts and cross-drains be of sufficient size and spacing, and properly installed, to allow for the movement of water through the road prism. Insufficient drainage or improper installation of drainage structures could adversely affect the road prism and nearby slope stability. Cross drain culvert locations included in the design are intended as a guide only and the actual location of these culverts in the field should be verified as being appropriate by qualified road construction personnel. Additional cross drain culverts may be required to control drainage. Experienced personnel should locate these additional culverts. Failure to properly locate cross drain culverts may contribute to road related slope instability.

1.3 GUIDELINES

The existing road was designed taking into consideration the guidelines described in the Ministry of Forests Engineering Manual (July 1993), the Forest Road Engineering Guidebook (2002), the Transportation Association of Canada (TAC) Manual of Geometric Design Standards for Canadian Roads, and the Forest and Range Practices Act. The level of detail of the design was adjusted to serve the purpose of this contract; therefore, it was appropriate not to include some of the details prescribed in the guidelines noted above (drainage design, for example).

2.0 ROAD DESIGN

2.1 DESIGN PARAMETERS

The following are the design parameters used to obtain the road alignments, templates and earthworks volumes. These parameters were determined using the previously mentioned guidelines (Section 1.3). Refer to Section 4.1 “Maximum Allowable Cut and Fill Slopes” for more information on designed side slopes.

2.1.1 SOILS

Soil type and soil characteristics have a substantial effect on the road alignments and earthworks volume estimations. Roads were designed by balancing final unit volumes. Following design, final unit volumes were converted to bank volumes using the compaction and expansion factors noted below.

Table 2. Ground Type Parameters

Ground Type		Cut		Fill	
SYMBOL	DESCRIPTION	Slope (%)	Bank to final conversion	Slope (%)	Bank to final conversion
TI	Till	70	1.0	70	1.0
T2	Till – Steep Cut	100	1.0	70	1.0
HR	Hard Rock	400	1.25	100	0.8

Forsite Engineering & Geoscience Ltd.

April 12, 2011

2.1.2 Road Parameters

The section of new construction is designed to the standards outlined in Schedule A, Article 4 of the Road Design Specifications and the above mentioned guidelines (section 1.3). Where Contract Specifications varied from the guidelines in section 1.3, the contract specifications as outlined by Schedule A took precedence.

In some situations, the parameters noted in Schedule A may not be attainable. Table 3 below summarizes these areas of concern or special interest.

Table 3 Summary of Road Design Concerns

Road Name	L-Line Index Station Range (approximate)		Comments
	Start Station	End Station	
Branch 17.6			
	0+000	0+992	No Variance, to contract standards
	0+992	1+004	Allowable favorable grade exceeded by 1% for short pitch (12m)
	0+798.1	4+544.2	No Variance, to contract standards
Branch 17.6A	0+000	0+307	No Variance, to contract standards
	0+307	0+318	Allowable favorable grade exceeded by 1% for short pitch (11m)
	0+318	1+271	No Variance, to contract standards
Branch 17.6D	0+000	0+874	No Variance, to contract standards
Branch 17.6E	0+000	0+085	No Variance, to contract standards
Branch 17.6F	0+000	0+070	No Variance, to contract standards
Branch 19	0+000	0+075	No Variance, to contract standards

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October 16, 2009

3.0 RESULTS

The geometric design is presented in the Appendices. There is a plan and profile sheet, road cross sections for p-line stations and culvert locations, culvert summary by size and RoadEng and traverse notes, and a copy of the contract specifications, Schedule A.

3.1 EARTHWORKS

Earthwork volume estimates for the road sections are summarized below in Table 3, the full breakdown by station is located in Appendix 7. All volume estimates have been rounded and are presented in **bank** volumes. End haul volumes indicated below do not include stripping materials.

Table 4 Summary of Earthworks Volume Estimates

ROAD Name	EARTHWORK VOLUME ESTIMATES*					
	Total Cut (m ³)	Stripping (OB) (m ³)	Till / Colluvium Cut (m ³)	Rock Cut (m ³)	Total Fill (m ³)	End Haul (m ³)
Branch 17.6	41460	15510	28140	13310	40340	0
Branch 17.6A	10460	4220	6670	3790	9740	0
Branch 17.6D	9590	3370	4400	5190	9150	0
Branch 17.6E	570	390	0	570	700	0
Branch 17.6F	1480	520	690	780	1340	0
Branch 19	370	350	330	40	390	0
Totals	63930	24360	40230	23680	61660	0

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April 12, 2011

*Volume estimates are rounded to the nearest 10m³.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 MAXIMUM ALLOWABLE CUT AND FILL SLOPES

A significant factor that influences cut and fill volumes within a road design is the maximum allowable cut and fill slopes. The Forest Road Engineering Guidebook (2002), pages 29 to 32, outlines a number of guidelines related to maximum suggested cut and fill slopes. The values outlined are a reflection of the natural angle of repose of different soil types. Often it is practical to include other factors in the selection of maximum allowable cut and fill side slopes. Factors such as environmental considerations, the life of the road, road maintenance schedules, road deactivation schedules, and road construction costs are all important variables in determining the allowable cut and fill slopes.

Cut and fill slope geometry for this project was determined based on the soil types and characteristics noted in the field by the field traverse.

4.2 DRAINAGE NETWORKS

The overall drainage system is meant to provide adequate drainage of surface run-off and sub-surface flow to reduce ponding of water, re-direction of water courses, and/or sedimentation of water bodies.

Culvert locations have been mapped on the Plan and Profile Sheets as per the field road centerline survey notes. Cross-drains have also been added as per the contract specification. Additional drainage culverts and cross-drain culverts may be needed. Locations should be verified by qualified road construction personnel during road construction.

4.3 ROAD TURNOUTS

Turnouts have been located as required along the proposed route to meet standards outlined in Schedule A6. Turnouts may be constructed in those areas where excess material can be wasted to reduce forwarding or end-haul costs.

Installation of turnouts is a highly desirable method of improving safety on roads. Additional turnouts may need to be field located if indivisibility has not been achieved. Should installation of sufficient turnouts not be possible, user safety can be improved by proper installation of traffic control devices. Signs warning users of reduced visibility should be installed in these areas.

4.4 WASTE VOLUME

During the iterative process of determining road alignments, complete balance of earthworks is often not possible or feasible and waste volume (either positive or negative) results. For the purposes of designing the road sections, earthwork volumes were analyzed and “balanced” in units of compacted material.

Estimates of stripping volume requirements have been made for the designed roads assuming an average stripping depth of 0.2m. Given the minimum clearing width of 10 m (shown on the Plan), ample space is available for proper disposal of stripping material within the road clearing width on most terrain.

4.5 ROAD GRADES

Some sections of the proposed roads may have road grades which exceed those suggested in the Ministry of Forests Engineering Manual, Table 2.0, Section 2.4, Chapter 2.0. and by the standards outlined in Schedule A. In situations where the road gradients exceed those suggested, user safety can be improved by proper installation of traffic control devices. Signs warning users of reduced visibility and excessive grades should be installed in these areas.

4.6 STOPPING SITE DISTANCE

A value commonly used to quantify the stopping sight distance and the changes of grades in and out of vertical curves is the K-value. The K -value describes the relative flatness of the vertical curve and equals the horizontal distance over which there is a 1% change in grade. A minimum K-value can then be determined given design speeds along the proposed road alignment. Where reasonable, a minimum K-value of 3.0 was targeted for most sections of road with a design speed of 20km/hr.

5.0 SUMMARY

A Geometric road design has been prepared for the proposed Branch 17.6, 17.6A, 17.6D, 17.6E, 17.6F and 19 roads. The total length of new construction is approximately 5,392m. The guidelines used for the geometric road design are listed in Section 1.

Final drainage design and the need for additional turnouts (as appropriate) should be reviewed by qualified personnel at the time of road construction.

Sincerely,

Forsite Engineering and Geoscience Ltd.

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Reviewed by:

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Michael Foster, P.Eng.
Project Engineer

APPENDICES

APPENDIX 1

Branch 17.6

Level 2 Geometric Road Design

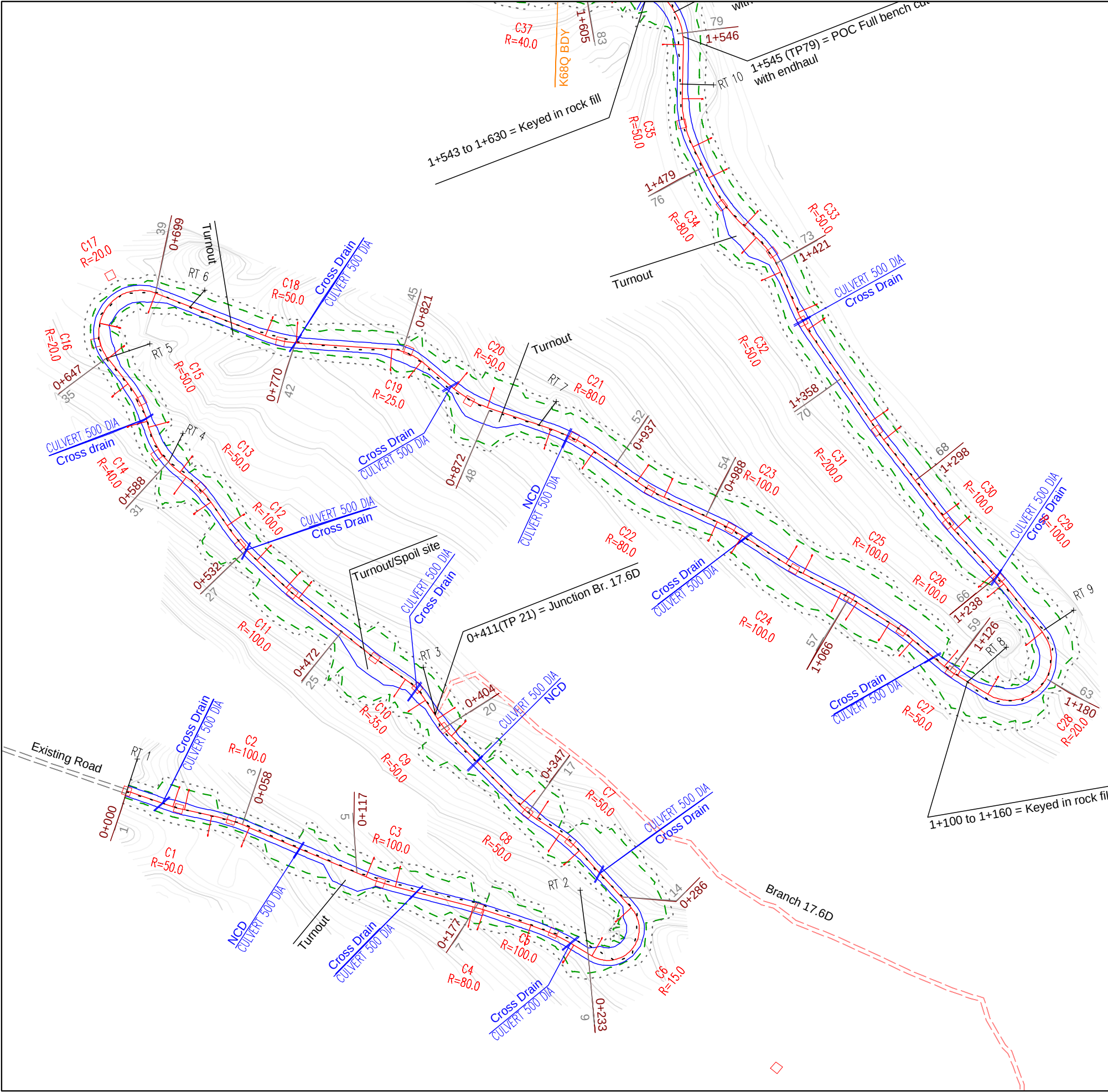
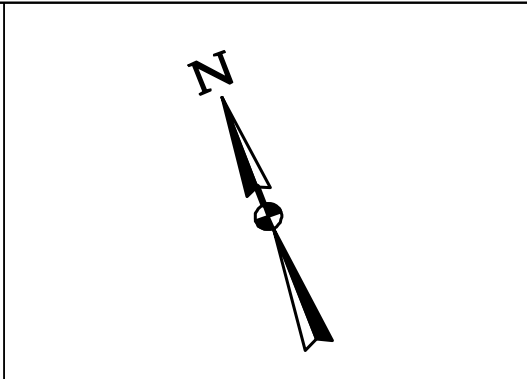
Bigmouth 17.6 Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+000	1	TI	HR		-0.2	109	73	0
0+028	2	TI	HR		-0.1	116	67	39
0+058	3	TI	HR		-0.1	6	175	90
0+087	4	TI	HR		-0.2	107	173	-79
0+117	5	TI	HR		0.3	126	68	-146
0+147	6	TI	HR		-0.1	149	125	-88
0+177	7	TI	HR		-0.5	112	127	-63
0+207	8	TI	HR		-0.7	5	320	-77
0+233	9	TI	HR		-2.3	4	218	-392
0+249	10	TI	HR		-0.1	9	8	-606
0+256	11	TI	HR		0.2	82	5	-605
0+267	12	TI	HR		-0.1	137	20	-521
0+276	13	TI	HR		0.0	148	16	-391
0+286	14	TI	HR		0.6	243	17	-253
0+302	15	TI	HR		0.0	245	117	-18
0+327	16	TI	HR		-0.5	136	114	115
0+347	17	TI	HR		-0.2	270	88	140
0+377	18	TI	HR		-0.6	31	41	327
0+382	19	TI	HR		-1.7	29	396	317
0+404	20	TI	HR		-1.4	43	114	-51
0+412	21	TI	HR		-0.2	92	193	-122
0+427	22	TI	HR		-0.2	89	150	-222
0+441	23	TI	HR		0.3	72	240	-281
0+452	24	TI	HR		-0.1	167	342	-448
0+472	25	T2	HR		0.5	225	188	-18
0+502	26	T2	HR		0.0	201	229	30
0+532	27	T2	HR		-0.2	37	32	10
0+537	28	T2	HR		-0.2	171	111	17
0+561	29	T2	HR		0.1	90	142	84
0+579	30	T2	HR		-1.0	44	100	35
0+588	31	TI	HR		-0.2	31	53	-20
0+600	32	TI	HR		-0.4	30	42	-40
0+612	33	TI	HR		0.0	68	40	-51
0+630	34	TI	HR		0.0	78	25	-23
0+647	35	TI	HR		0.3	64	11	33
0+653	36	TI	HR		-0.2	24	87	90
0+668	37	TI	HR		-0.9	0	159	27
0+683	38	TI	HR		-1.3	22	70	-132
0+699	39	TI	HR		0.4	112	0	-180
0+716	40	TI	HR		0.8	158	5	-68
0+744	41	TI	HR		0.1	107	40	87
0+770	42	TI	HR		-0.2	95	100	154
0+797	43	TI	HR		-0.3	69	70	149
0+812	44	TI	HR		-0.6	23	112	149
0+821	45	TI	HR		-1.3	11	122	60
0+833	46	TI	HR		-0.3	100	34	-51
0+850	47	TI	HR		0.7	256	330	17
0+872	48	TI	HR		0.6	260	262	-47

Bigmouth 17.6 Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+896	49	TI	HR		-0.1	46	16	-42
0+902	50	TI	HR		0.6	65	42	-11
0+911	51	TI	HR		-0.7	171	189	14
0+938	52	TI	HR		-0.2	127	185	-3
0+958	53	TI	HR		-0.4	183	217	-60
0+988	54	TI	HR		0.0	215	106	-92
1+009	55	TI	HR		0.2	272	279	22
1+037	56	TI	HR		-0.1	315	346	21
1+066	57	TI	HR		-0.2	352	324	-6
1+096	58	TI	HR		0.3	213	257	28
1+126	59	TI	HR		-2.0	0	380	-70
1+136	60	TI	HR		-5.2	0	604	-545
1+150	61	TI	HR		-2.5	0	489	-1300
1+164	62	TI	HR		-2.0	45	235	-1869
1+180	63	TI	HR		1.6	541	0	-2058
1+195	64	TI	HR		4.7	390	0	-1450
1+204	65	TI	HR		3.8	772	3	-1003
1+238	66	TI	HR		0.7	191	180	-155
1+268	67	TI	HR		0.1	180	211	-141
1+298	68	TI	HR		-0.6	172	167	-170
1+328	69	TI	HR		0.1	150	170	-163
1+358	70	TI	HR		-0.2	72	59	-183
1+370	71	TI	HR		0.0	114	133	-169
1+391	72	TI	HR		-0.6	200	107	-187
1+421	73	TI	HR		0.6	127	71	-91
1+434	74	TI	HR		1.0	144	289	-31
1+457	75	TI	HR		-0.3	106	79	-174
1+479	76	TI	HR		0.3	122	62	-146
1+502	77	TI	HR		0.4	167	10	-85
1+521	78	TI	HR		1.3	540	0	78
1+546	79	T2	HR		3.4	313	133	676
1+560	80	T2	HR		-0.6	26	721	857
1+573	81	T2	HR		-6.9	51	647	-17
1+591	82	T2	HR		0.9	113	103	-773
1+605	83	T2	HR		-0.8	171	47	-783
1+618	84	T2	HR		2.3	248	46	-655
1+636	85	TI	HR		-0.2	105	209	-436
1+651	86	TI	HR		-1.0	197	285	-538
1+675	87	TI	HR		0.1	279	194	-624
1+705	88	TI	HR		0.5	242	151	-533
1+735	89	TI	HR		-0.1	148	675	-436
1+759	90	TI	HR		-0.9	89	434	-961
1+771	91	TI	HR		-0.4	262	735	-1303
1+801	92	TI	HR		0.6	130	20	-1768
1+817	93	TI	HR		0.7	116	288	-1654
1+847	94	TI	HR		-2.0	0	416	-1876
1+865	95	TI	HR		-2.9	0	692	-2396
1+883	96	TI	HR		-3.2	0	248	-3261

Bigmouth 17.6 Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
1+893	97	TI	HR		-1.2	58	31	-3524
1+903	98	TI	HR		1.6	421	0	-3496
1+914	99	TI	HR		4.9	1277	0	-3021
1+940	100	TI	HR		5.2	822	0	-1532
1+963	101	TI	HR		1.8	265	100	-598
1+993	102	TI	HR		-0.4	158	174	-420
2+023	103	TI	HR		0.4	214	152	-434
2+046	104	TI	HR		1.0	285	1256	-364
2+076	105	TI	HR		0.7	197	907	-1325
2+103	106	TI	HR		0.2	238	140	-2032
2+132	107	TI	HR		0.1	265	111	-1930
2+157	108	TI	HR		1.0	247	326	-1766
2+187	109	TI	HR		-0.9	91	286	-1838
2+207	110	T2	HR		-0.1	164	278	-2033
2+237	111	T2	HR		-1.6	108	376	-2185
2+266	112	T2	HR		-1.0	20	282	-2547
2+288	113	T2	HR		-1.8	1	766	-2879
2+309	114	T2	HR		-5.7	0	764	-3836
2+324	115	T2	HR		-4.7	23	289	-4724
2+340	116	TI	HR		0.9	677	0	-4990
2+356	117	TI	HR		6.3	1266	0	-4214
2+374	118	T2	HR		4.8	401	17	-2723
2+392	119	T2	HR		-0.6	99	98	-2276
2+413	120	T2	HR		0.6	226	57	-2268
2+436	121	T2	HR		1.0	364	74	-2059
2+465	122	T2	HR		1.0	254	19	-1714
2+484	123	T2	HR		1.7	451	8	-1457
2+514	124	T2	HR		1.6	455	14	-971
2+543	125	T2	HR		1.7	260	10	-486
2+561	126	T2	HR		1.6	384	16	-213
2+591	127	T2	HR		1.3	115	9	186
2+604	128	T2	HR		0.7	76	81	299
2+620	129	TI	HR		-1.1	8	306	282
2+635	130	TI	HR		-3.2	0	847	-93
2+657	131	TI	HR		-3.6	10	298	-1152
2+670	132	TI	HR		-0.3	129	18	-1514
2+685	133	TI	HR		1.2	520	0	-1404
2+701	134	TI	HR		4.1	538	0	-824
2+720	135	TI	HR		1.7	159	37	-220
2+738	136	T2	HR		-0.5	119	283	-88
2+752	137	T2	HR		-0.2	667	475	-255
2+782	138	T2	HR		-0.9	194	158	-112
2+807	139	TI	HR		0.1	149	215	-66
2+837	140	TI	HR		-0.7	69	163	-131
2+859	141	TI	HR		-0.2	107	73	-225
2+876	142	TI	HR		0.3	132	100	-199
2+897	143	TI	HR		-0.5	227	63	-190
2+920	144	TI	HR		1.1	270	85	-31

Bigmouth 17.6 Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
2+942	145	TI	HR		0.5	33	185	167
2+954	146	TI	HR		-2.0	179	441	16
2+967	147	TI	HR		0.3	452	355	-235
2+996	148	TI	HR		1.2	210	4	-126
3+018	149	TI	HR		0.0			88

PLAN AND PROFILE SHEETS

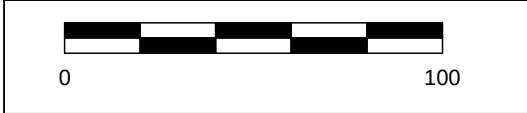
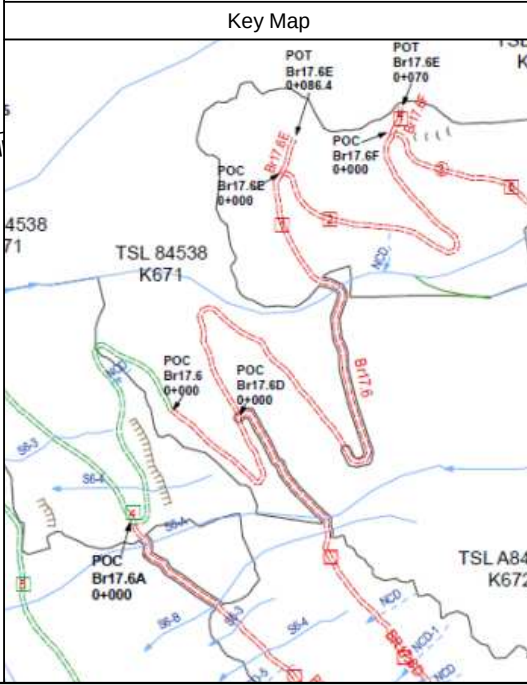


Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

Legend	
	L-Line Location
	P-line Location
	Road Edges
	Slope Stake Elevation
	Clearing Limits
	Culverts
	RT
	2m Contours
	Proposed Road

Plan Scale 1:2000



TSL A84538
Bigmouth
Proposed Branch 17.6
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 149 - 3+017

Design Template Key	
Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

Culvert Summary				
Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
4	0+018.1	500	10.0	120
	0+087.3	500	9.0	100
	0+147.0	500	9.0	120
6	0+225.0	500	10.0	110
	0+301.8	500	9.0	70
15	0+381.5	500	10.0	90
19	0+426.7	500	11.0	80
22	0+531.8	500	9.0	70
27	0+612.0	500	9.0	75
33	0+769.8	500	10.0	120
42	0+850.0	500	9.0	110
47	0+910.9	500	10.0	90
51	1+009.2	500	9.0	110
55	1+116.0	500	9.0	110
66	1+237.6	500	9.0	75

Reference Point Summary					
Index	P-Stn m.	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
1	0+000.0	0+000.0	40.0°	16.5	RT 1
9	0+230.2	0+232.5	14.0°	26.3	RT 2
21	0+412.2	0+411.8	7.0°	23.0	RT 3
31	0+588.4	0+588.4	48.0°	15.0	RT 4
35	0+646.7	0+646.8	93.0°	22.0	RT 5
40	0+716.8	0+716.2	63.0°	11.0	RT 6
49	0+897.6	0+896.2	58.0°	14.0	RT 7
60	1+138.0	1+135.9	70.0°	25.0	RT 8
65	1+208.3	1+203.6	78.0°	17.0	RT 9

Page 1 of 3

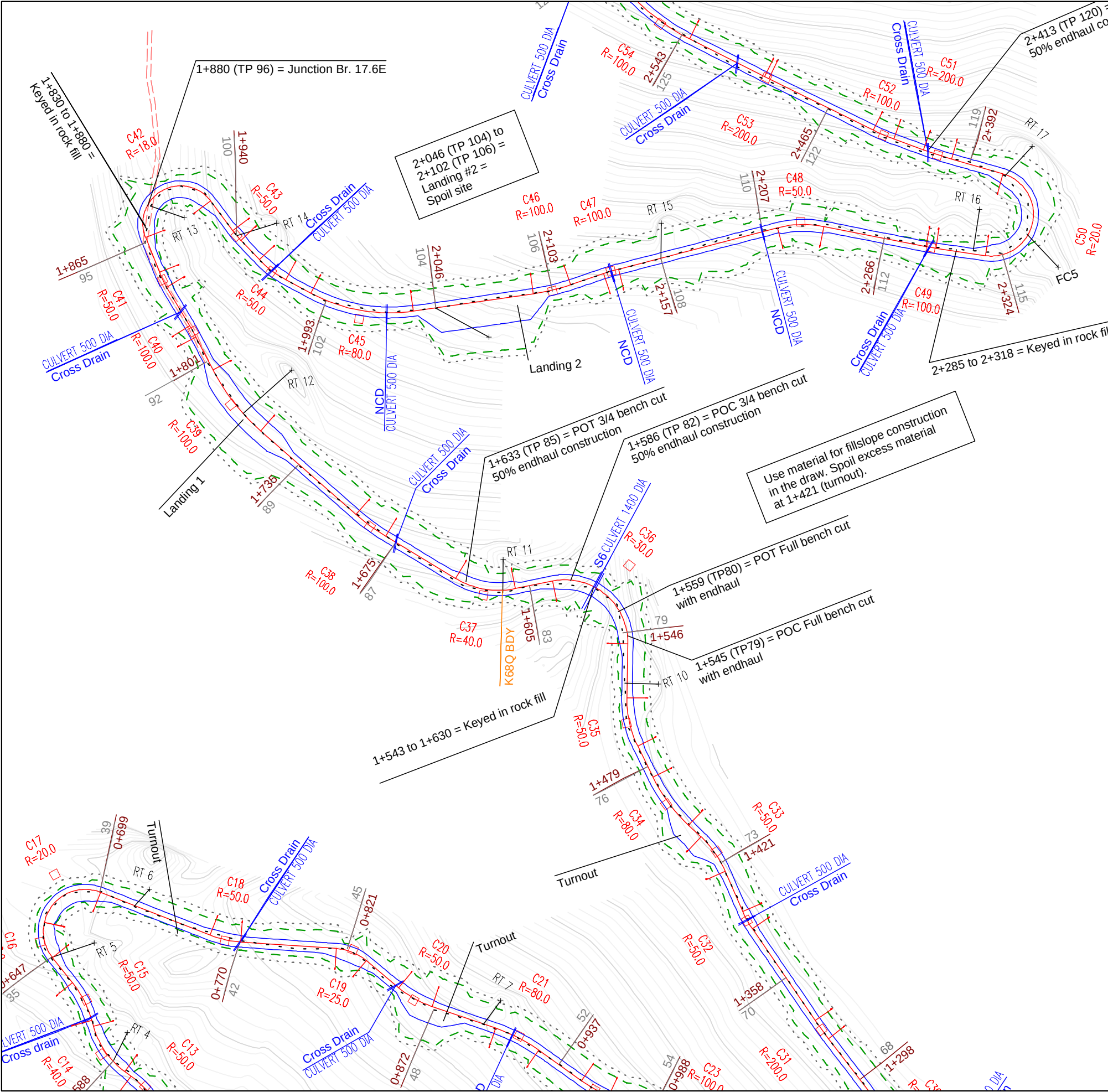
Design Date 09/04/09 Design By: Brett Barnard, FIT

Plotting Date 09/05/13 Checked By: Michael Foster, P.Eng

S:\23\15\Current\8\Bigmouth A84538\17-6\17-6 Rd Design.dsn

Prepared By:
Forsite Engineering & Geoscience Ltd.
PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366





BCTS
BC Timber Sales
Okanagan - Columbia

TSL A84538
Bigmouth
Proposed Branch 17.6
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 149 - 3+017

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv. Grade	-8%
Max Short Pitch Grade	-10%

Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

Legend

- L-Line Location
- P-line Location
- Road Edges
- Slope Stake Elevation
- Clearing Limits
- Culverts
- RT
- 2m Contours
- Proposed Road

Plan Scale 1:2000



Culvert Summary

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
72	1+391.2	500	9.0	90
81	1+572.9	1400	20.0	90
87	1+675.0	500	9.0	70
	1+827.8	500	9.0	70
101	1+963.3	500	11.0	100
103	2+022.7	500	9.0	90
107	2+132.2	500	9.0	90
110	2+206.9	500	8.0	90
113	2+288.3	500	9.0	110
120	2+413.0	500	9.0	70

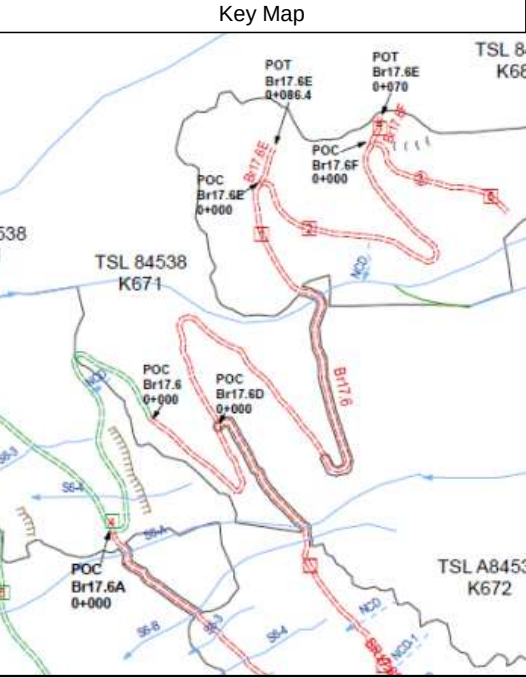
Reference Point Summary

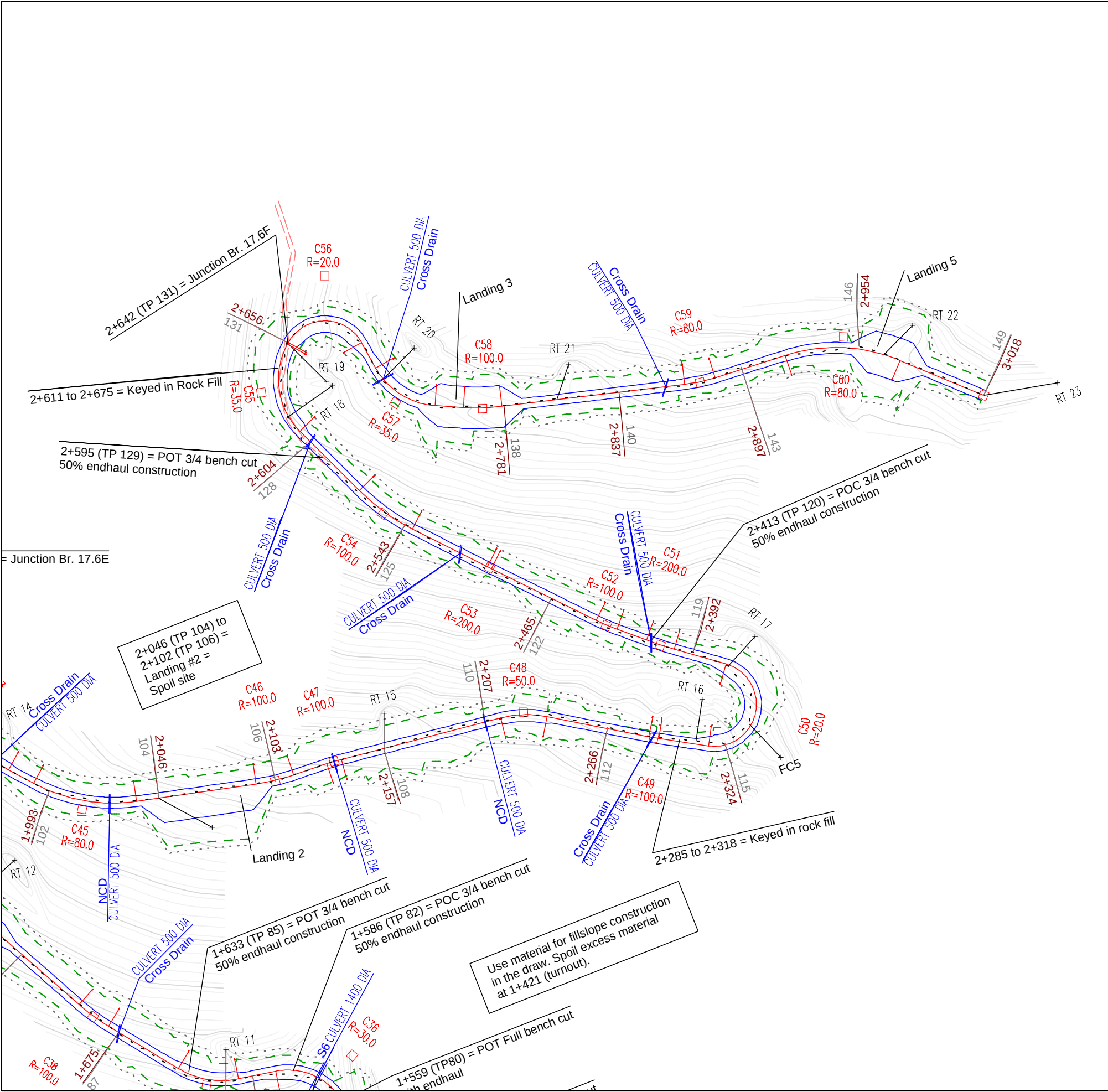
Index	P-Stn m.	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
78	1+524.8	1+521.2	113.0°	16.0	RT 10
84	1+620.4	1+618.0	22.0°	16.0	RT 11
91	1+773.3	1+770.7	70.0°	31.0	RT 12
96	1+884.6	1+883.2	130.0°	17.0	RT 13
100	1+940.2	1+939.5	94.0°	20.0	RT 14
104	2+047.2	2+046.4	140.0°	29.0	LDG 2
108	2+157.5	2+156.8	22.0°	17.0	RT 15
114	2+310.1	2+309.3	30.0°	20.0	RT 16
116	2+338.8	2+339.5	158.0°	21.8	[N]FC 5
118	2+370.3	2+374.2	64.0°	19.0	RT 17

Page 2 of 3

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng
S:\23\15\Current\8\Bigmouth A84538\17-6\17-6 Rd Design.dsn			

Prepared By:
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PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366





TSL A84538
Bigmouth
Proposed Branch 17.6
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 149 - 3+017

Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

Legend

- L-Line Location
- P-line Location
- Road Edges
- Slope Stake Elevation
- Clearing Limits
- Culverts
- RT
- 2m Contours
- Proposed Road

Plan Scale 1:2000

Culvert Summary

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
124	2+513.7	500	9.0	70
128	2+603.8	500	8.0	80
135	2+719.8	500	11.0	100
141	2+859.3	500	9.0	115

Reference Point Summary

Index	P-Stn m.	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
129	2+614.7	2+619.7	76.0°	26.0	RT 18
131	2+650.6	2+656.5	156.0°	27.0	RT 19
135	2+714.9	2+719.8	66.0°	22.0	RT 20
139	2+802.2	2+807.0	40.0°	17.0	RT 21
147	2+962.2	2+966.6	66.0°	19.0	RT 22
149	3+014.0	3+017.9	102.0°	36.0	RT 23

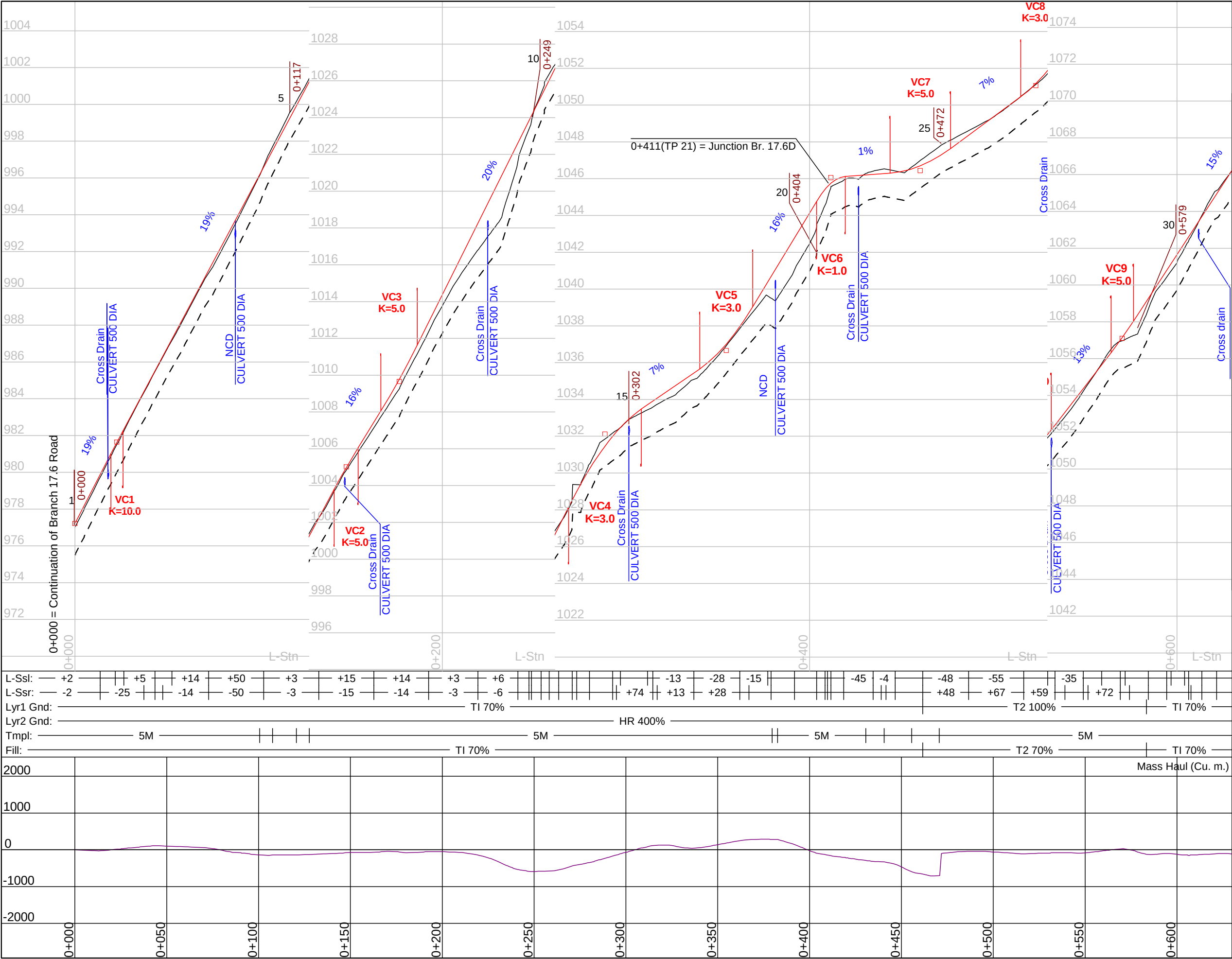
Key Map

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Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

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Bigmouth
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UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 149 - 3+017

Design Template Key

Template ID	Description
5M	5 meter road
TO	Turnout template
TP	Taper template
W	Waste template
LDG	Landing template

Soils

Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width
T1 Till	70%	70%	0.5m X 0.3m
T2 Till - steep cut	100%	70%	0.5m X 0.3m
HR Hard Rock	400%	100%	0.5m X 0.3m

Earthworks Summary

L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+000.0		419.7	263.1	0.0
0+100.0	277.7	358.3	329.1	-142.1
0+200.0	445.2	628.0	339.4	-55.1
0+300.0	612.8	678.1	401.7	-70.3
0+400.0	721.6	1322.1	447.5	-26.8
0+500.0	690.3	673.2	360.9	-58.6
0+600.0	605.4	433.6	244.6	-126.4
0+700.0	275.7			
Pg. Tot.	3628.8	4513.1	2386.2	
Cum. Tot.	3628.8	4513.1	2386.2	

Legend

- Ground Topography
- Profile Subgrade
- Culverts
- Gnd Layer 1
- Index Station

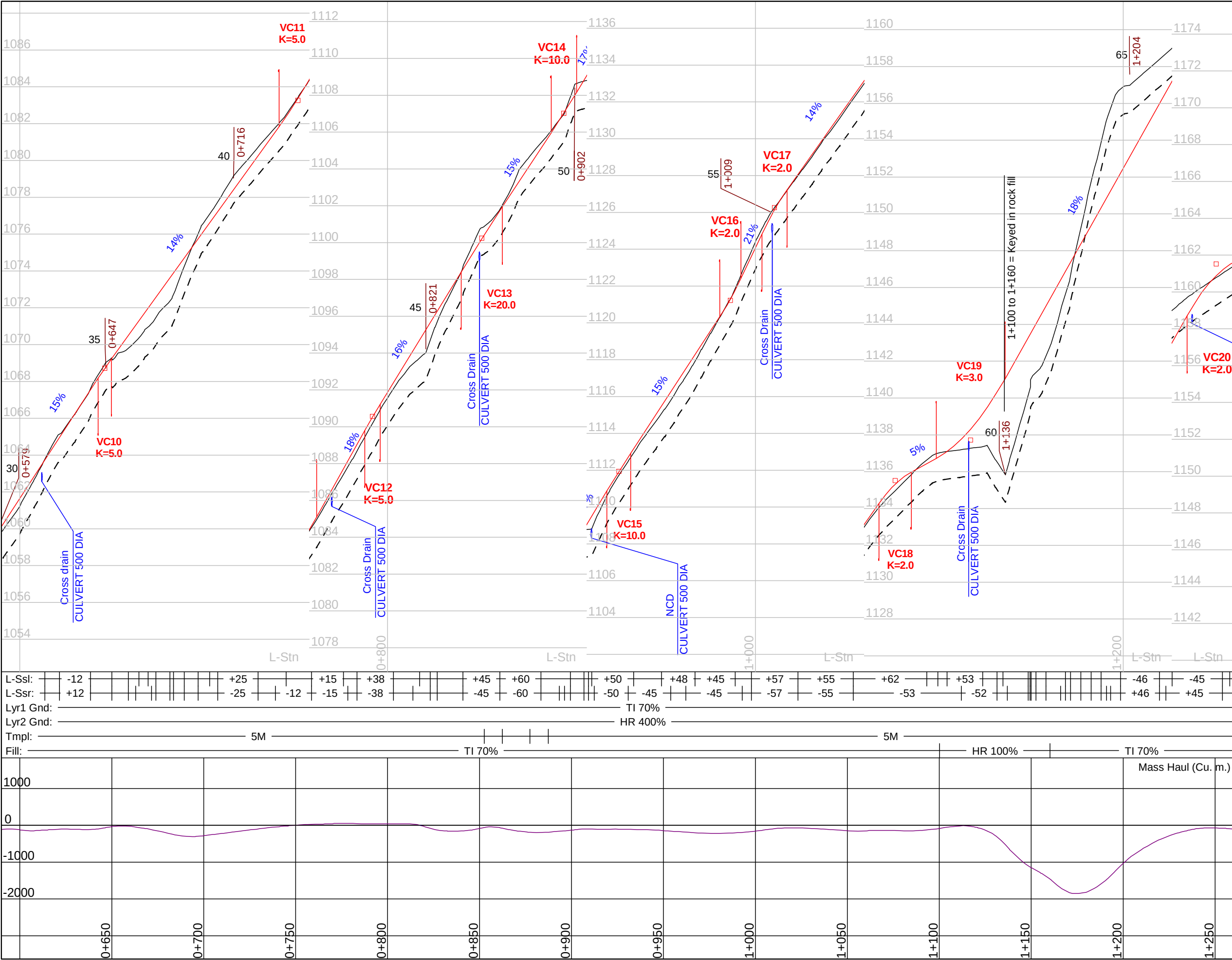
Vertical Scale 1:200
Horizontal Scale 1:2000

Page 1 of 5

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng
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TSL A84538
Bigmouth
Proposed Branch 17.6
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 149 - 3+017

Design Template Key				
Template ID	Description			
5M	5 meter road			
TO	Turnout template			
TP	Taper template			
W	Waste template			
LDG	Landing template			
Soils				
Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width	
T1 Till	70%	70%	0.5m X 0.3m	
T2 Till - steep cut	100%	70%	0.5m X 0.3m	
HR Hard Rock	400%	100%	0.5m X 0.3m	
Earthworks Summary				
L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+600.0	275.7	433.6	244.6	-126.4
0+700.0	474.1	154.7	240.8	-284.3
0+800.0	757.8	930.1	395.2	35.1
0+900.0	664.2	687.3	397.5	-137.2
1+000.0	1095.0	1024.9	536.6	-160.3
1+100.0	993.8	1938.2	356.7	-90.1
1+200.0	1310.1	409.5	344.4	-1034.5
1+300.0				
Pg. Tot.	5570.8	5578.3	2515.7	
Cum. Tot.	8923.8	9657.7	4657.3	

Legend

- Ground Topography
- Profile Subgrade
- Culverts
- Gnd Layer 1
- Index Station

Vertical Scale 1:200
Horizontal Scale 1:2000

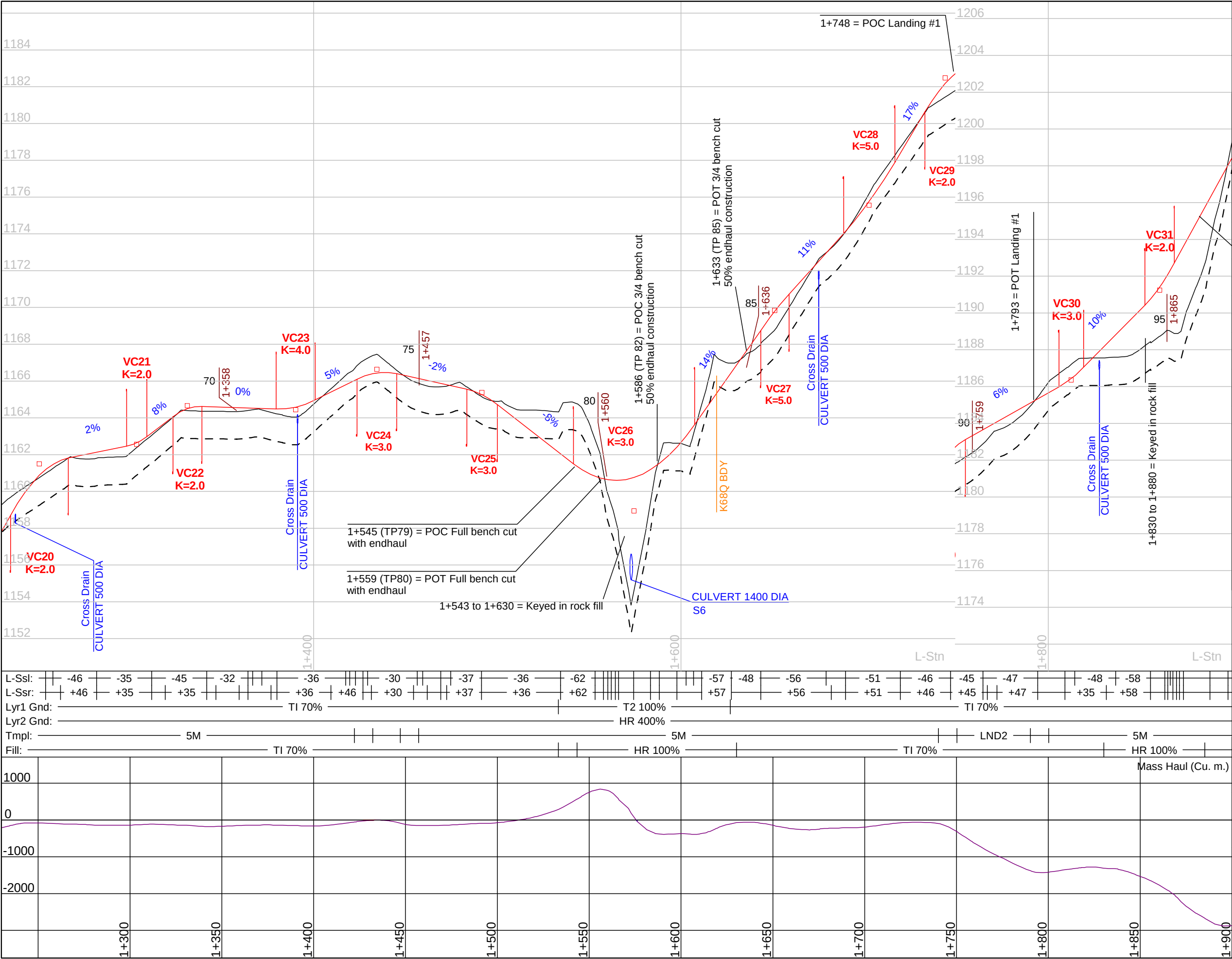
Page 2 of 5

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

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Bigmouth
Proposed Branch 17.6
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Level 2 Road Survey
1 - 0+000 to 149 - 3+017

Design Template Key

Template ID	Description
5M	5 meter road
TO	Turnout template
TP	Taper template
W	Waste template
LDG	Landing template

Soils

Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width
T1 Till	70%	70%	0.5m X 0.3m
T2 Till - steep cut	100%	70%	0.5m X 0.3m
HR Hard Rock	400%	100%	0.5m X 0.3m

Earthworks Summary

L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
1+300.0		560.5	334.9	-133.9
1+400.0	540.0	549.6	334.3	-154.5
1+500.0	634.5	1491.4	334.8	-69.6
1+600.0	1193.4	804.7	421.2	-367.5
1+700.0	985.6	2011.0	513.0	-186.5
1+800.0	783.3	1727.8	321.9	-1414.2
1+900.0	276.1	153.6	334.0	-2865.9
2+000.0	2851.9			
Pg. Tot.	7264.8	7298.6	2594.1	
Cum. Tot.	16188.6	16956.3	7251.4	

Legend

- Ground Topography
- Profile Subgrade
- Culverts
- Gnd Layer 1
- Index Station

Vertical Scale 1:200
Horizontal Scale 1:2000

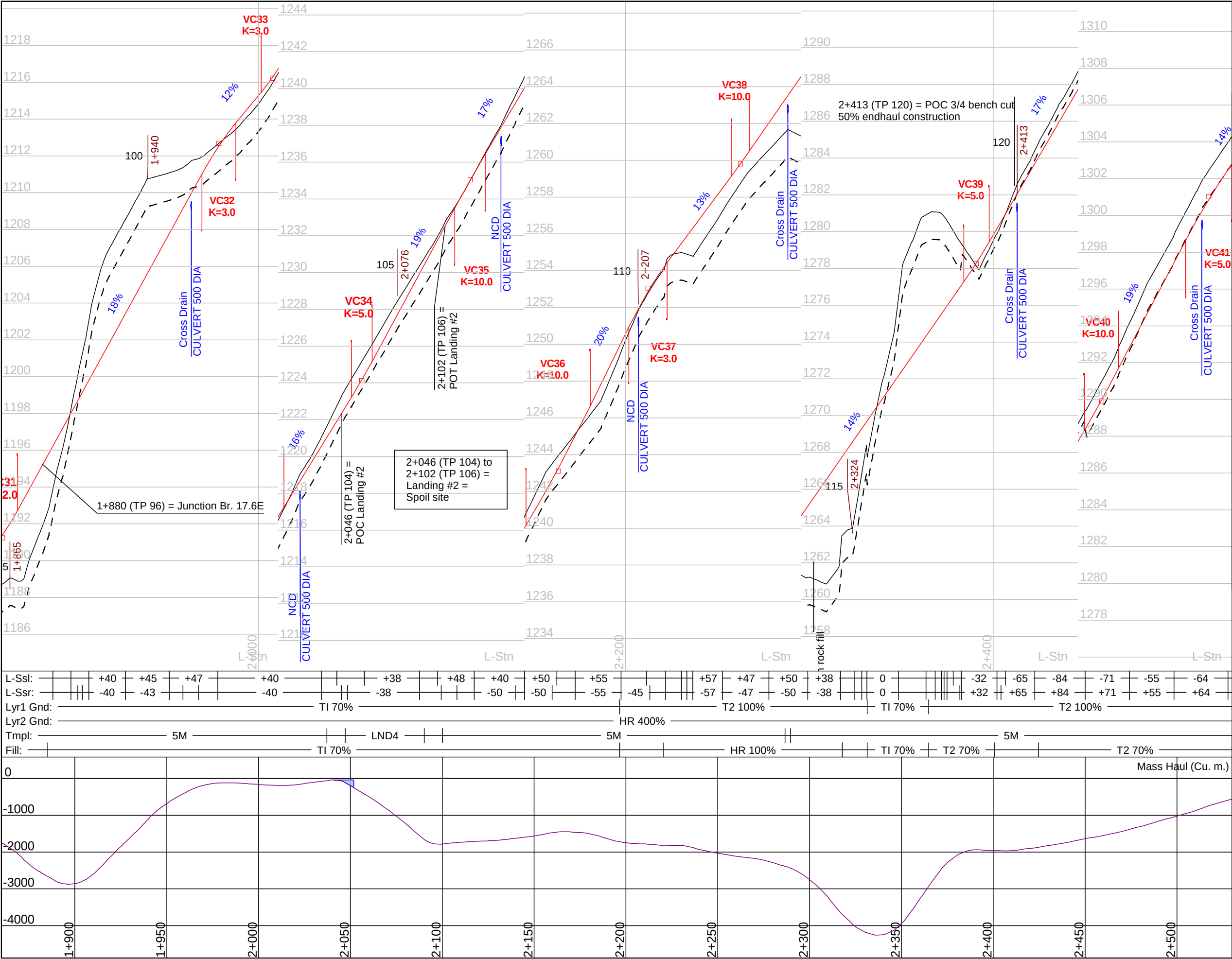
Page 3 of 5

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

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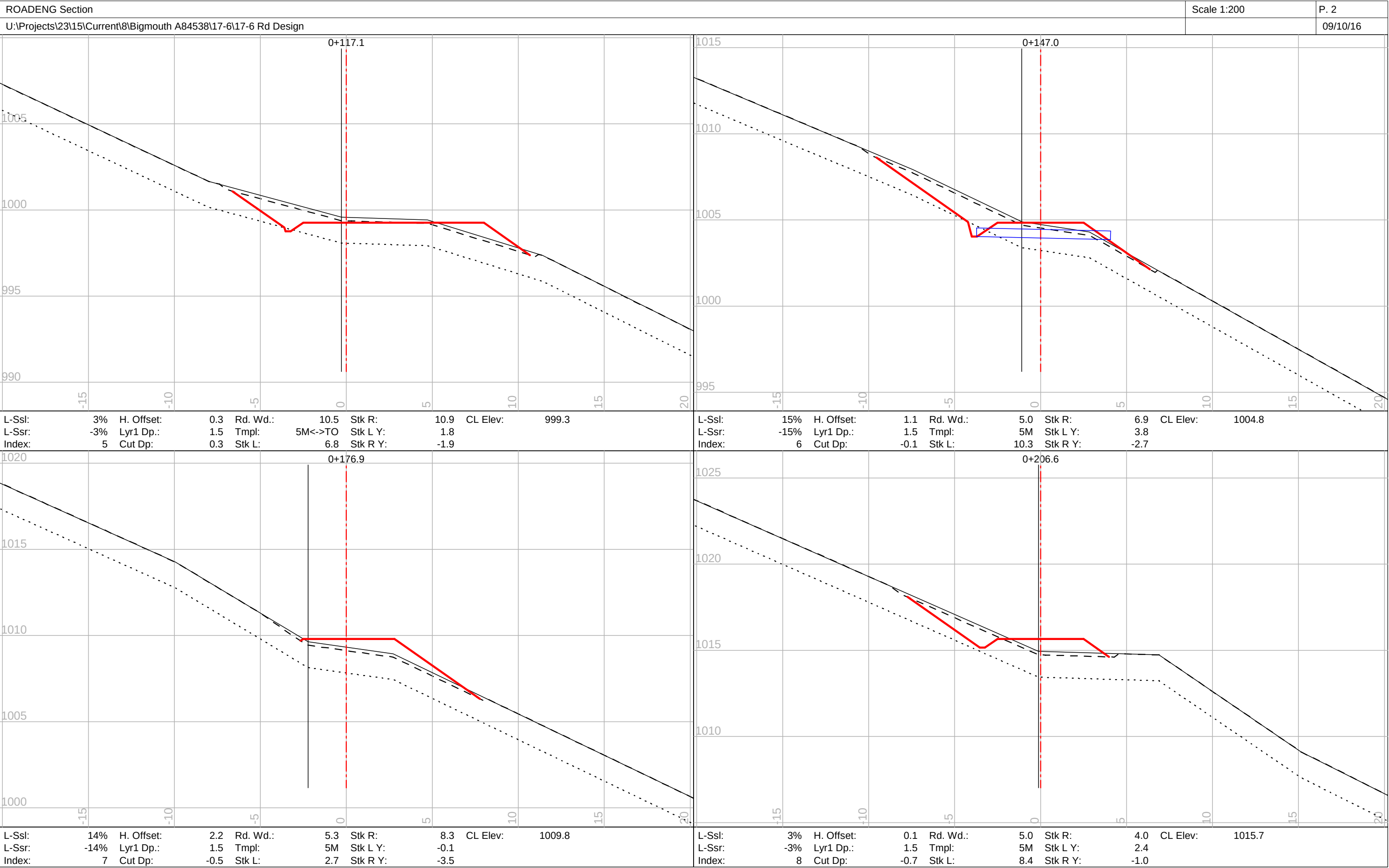
BC Timber Sales
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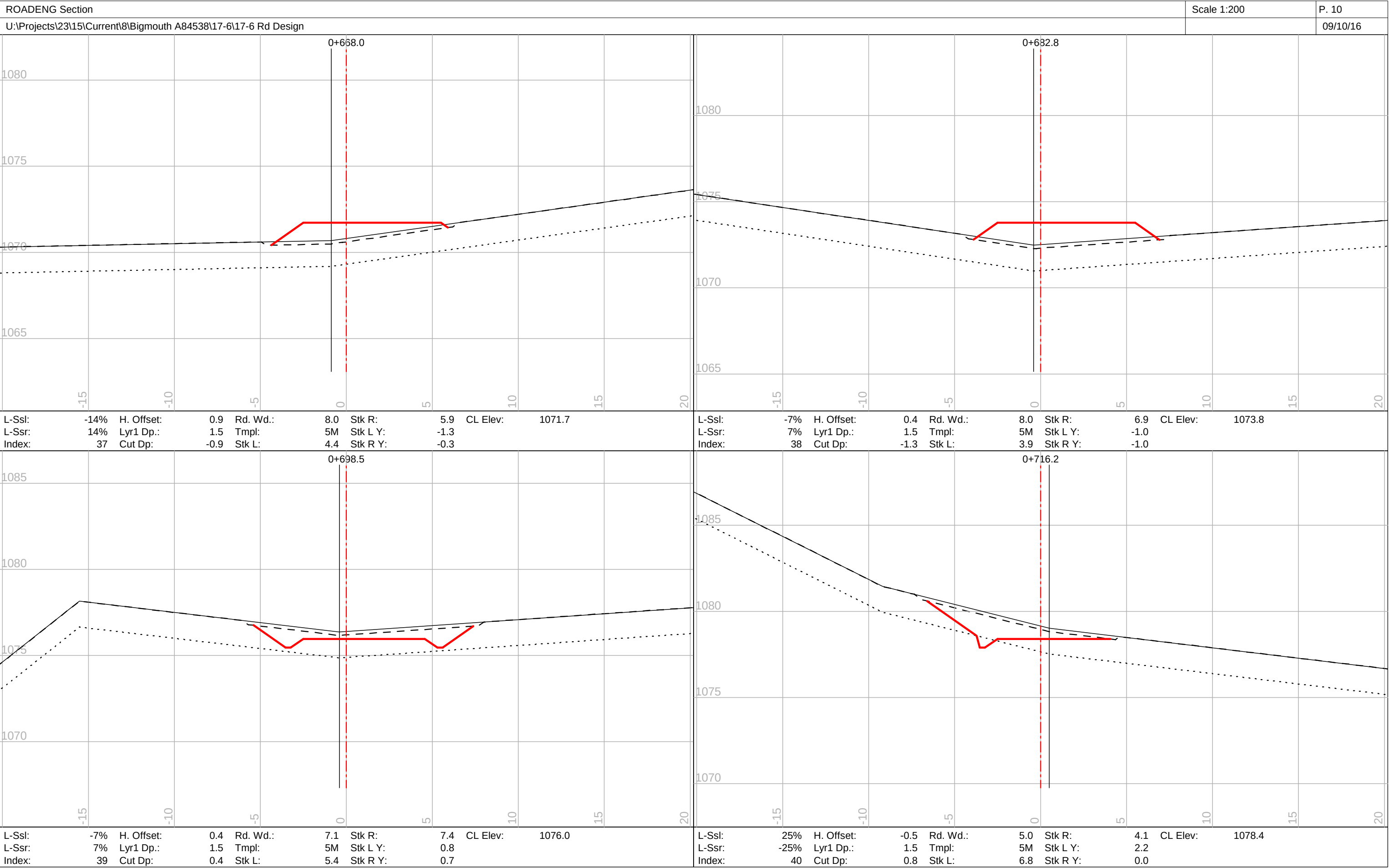
TSL A84538
Bigmouth
Proposed Branch 17.6
UBI - 40BK68Q

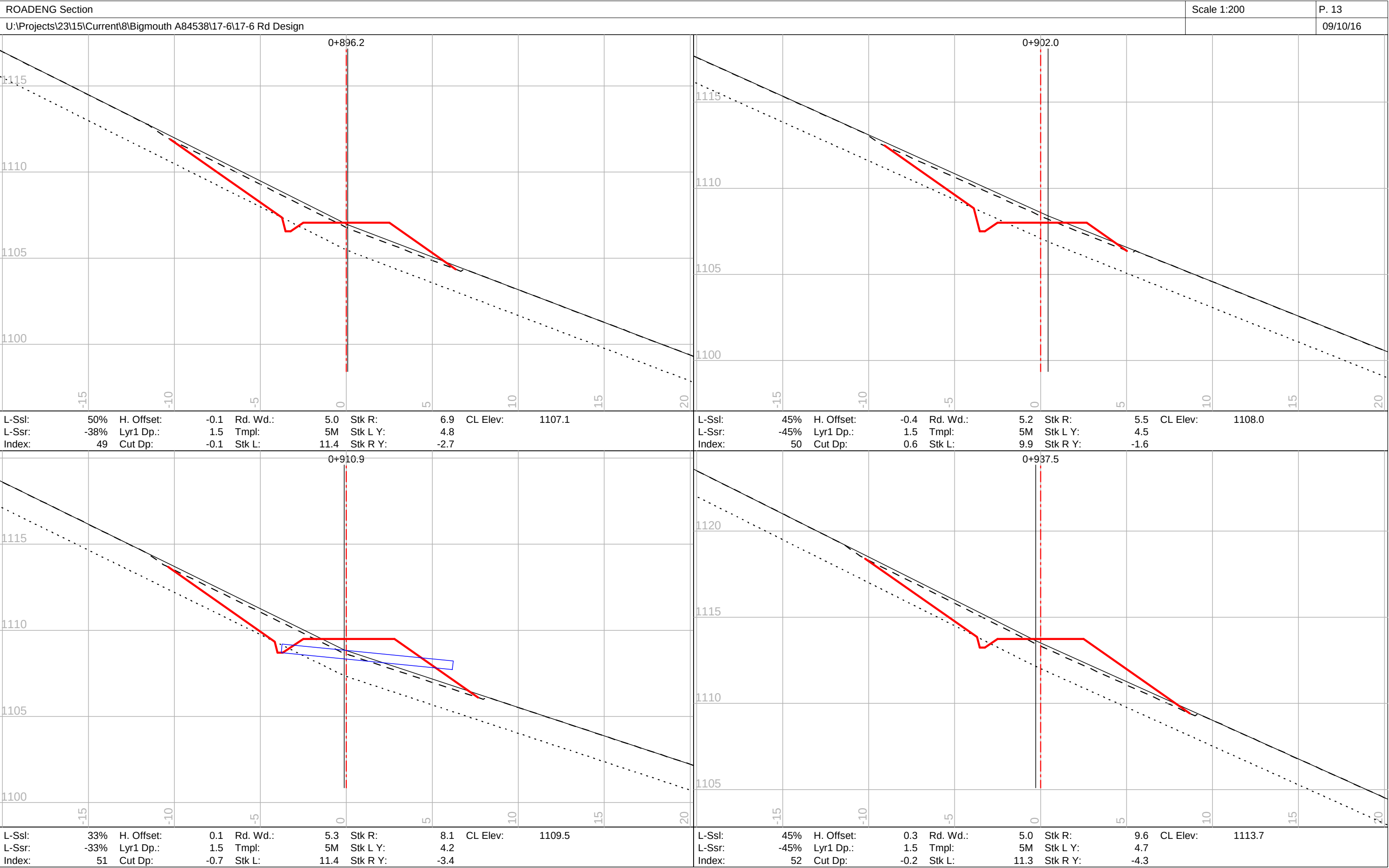
Level 2 Road Survey
1 - 0+000 to 149 - 3+017

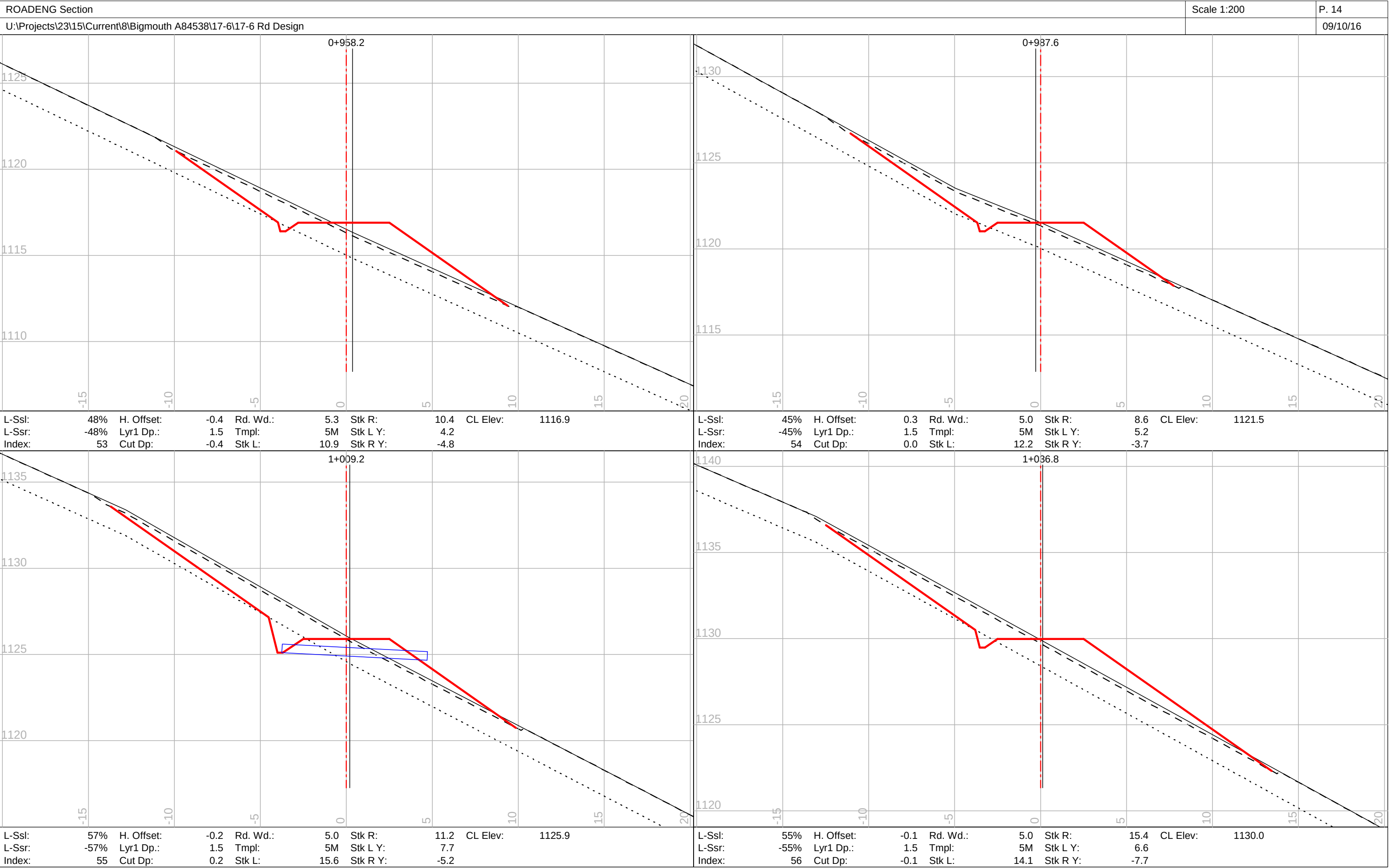
Design Template Key				
Template ID	Description			
5M	5 meter road			
TO	Turnout template			
TP	Taper template			
W	Waste template			
LDG	Landing template			
Soils				
Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width	
T1 Till	70%	70%	0.5m X 0.3m	
T2 Till - steep cut	100%	70%	0.5m X 0.3m	
HR Hard Rock	400%	100%	0.5m X 0.3m	
Earthworks Summary				
L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
1+900.0	2851.9	153.6	334.0	-2865.9
2+000.0	804.6	2423.4	509.5	-167.7
2+100.0	839.7	806.1	444.1	-1786.5
2+200.0	320.9	1325.3	327.3	-1752.9
2+300.0	2364.1	1573.6	318.5	-2757.4
2+400.0	1151.6	213.6	288.9	-1966.9
2+500.0	1403.6	53.4	297.5	-1028.9
Pg. Tot.	9736.4	6549.2	2519.7	
Cum. Tot.	23073.2	23351.9	9437.1	
Legend				
— Ground Topography				
— Profile Subgrade				
— Culverts				
- - - Gnd Layer 1				
Index Station				
Vertical Scale 1:200 Horizontal Scale 1:2000				
Page 4 of 5				
Design Date	09/04/09	Design By:	Brett Barnard, FIT	
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng	
S:\23\15\Current\8\Bigmouth A84538\17-6\17-6 Rd Design.dsn				
Prepared By: Forsite Engineering & Geoscience Ltd. PO Box 1012 Salmon Arm, BC V1E 4R1 250-832-3366				

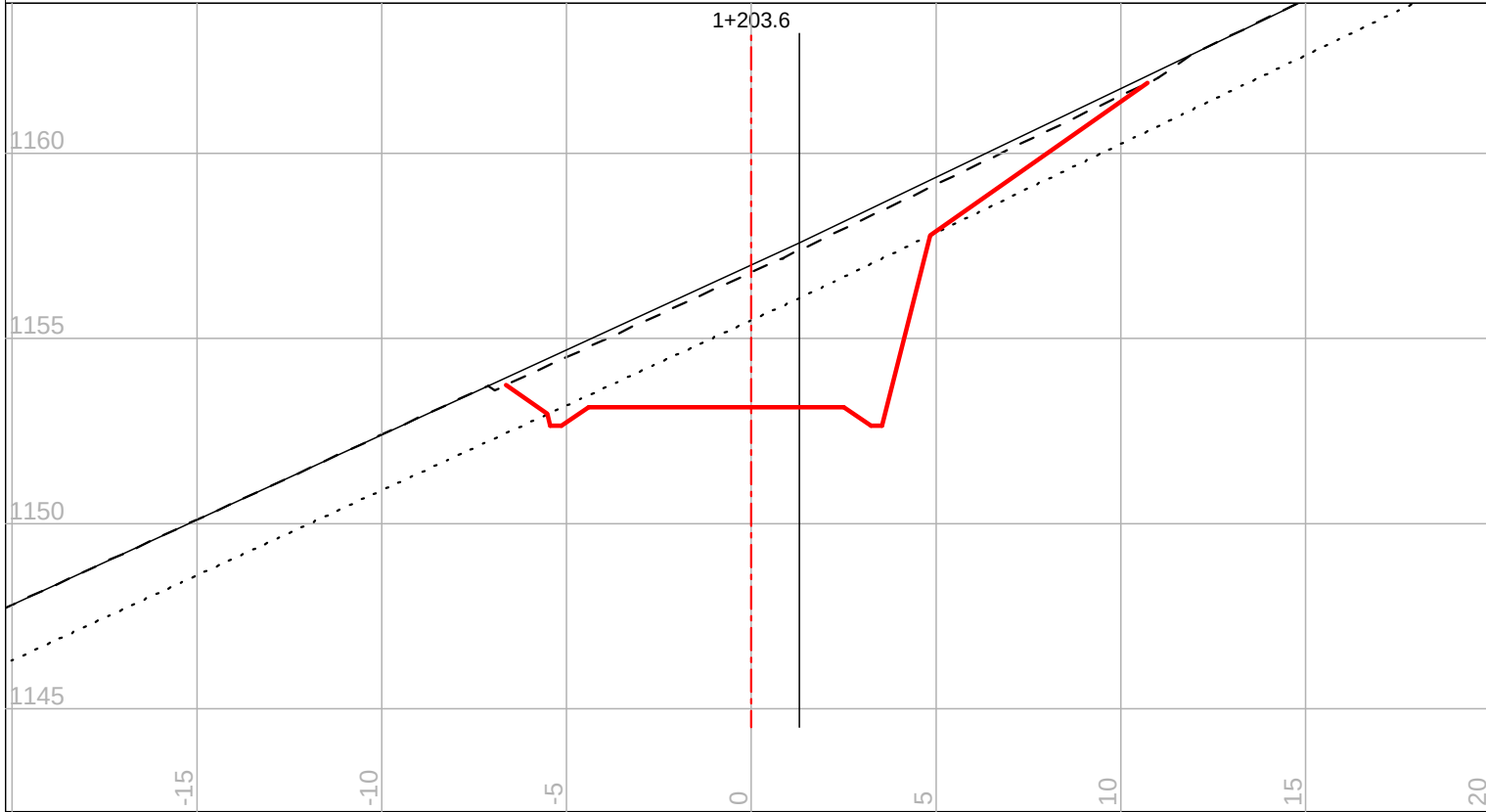
ROAD CROSS-SECTIONS



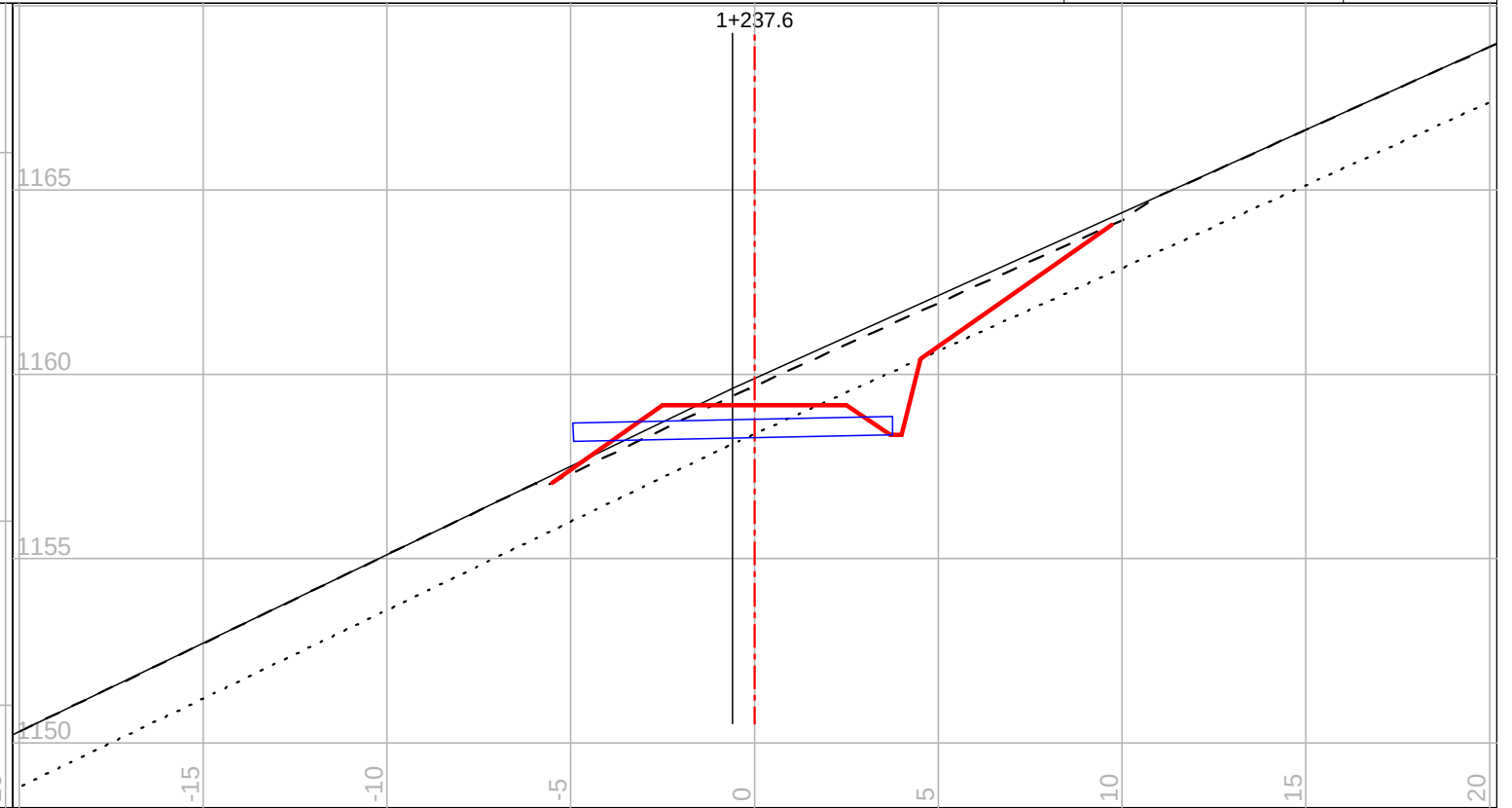




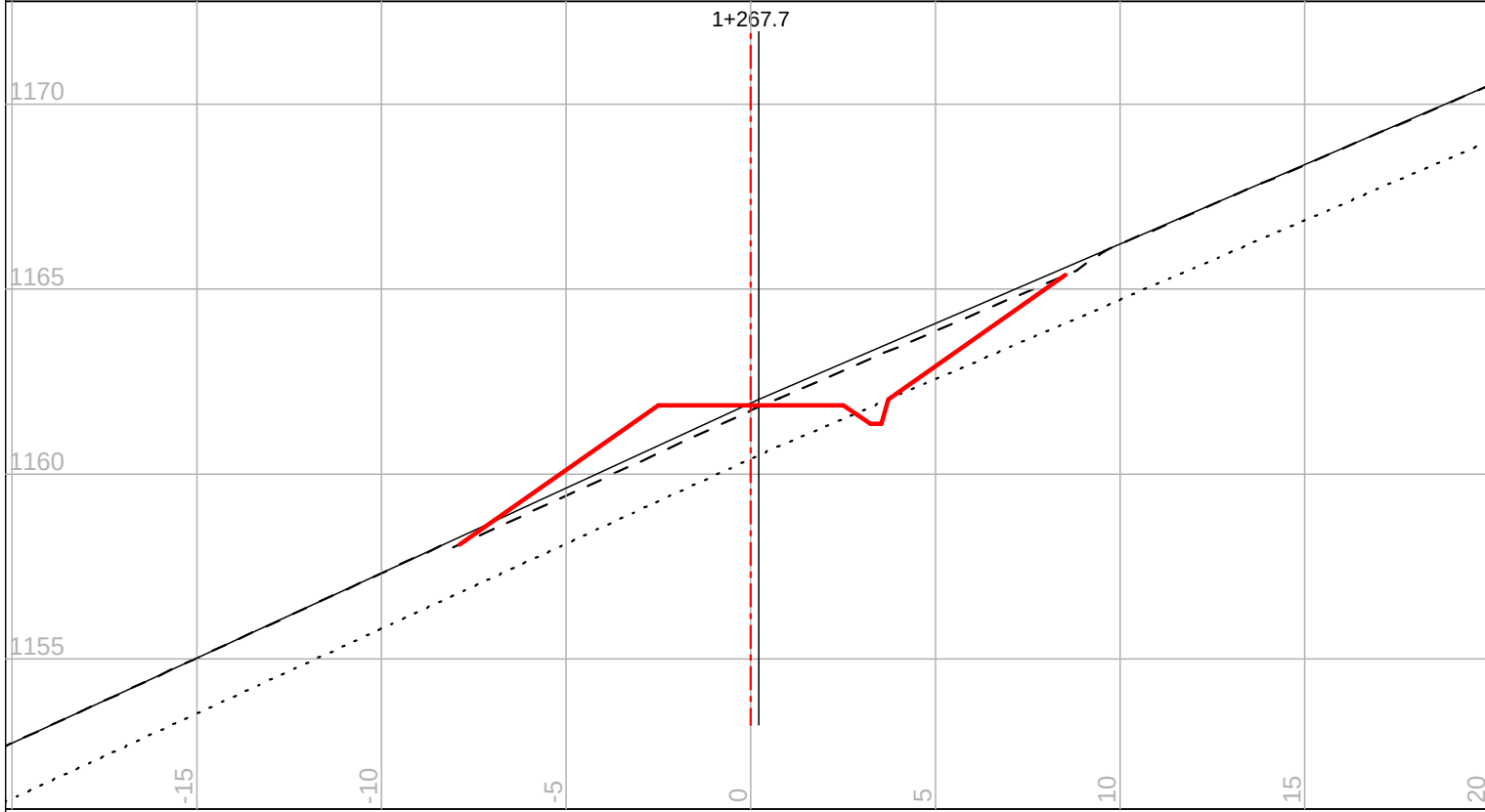




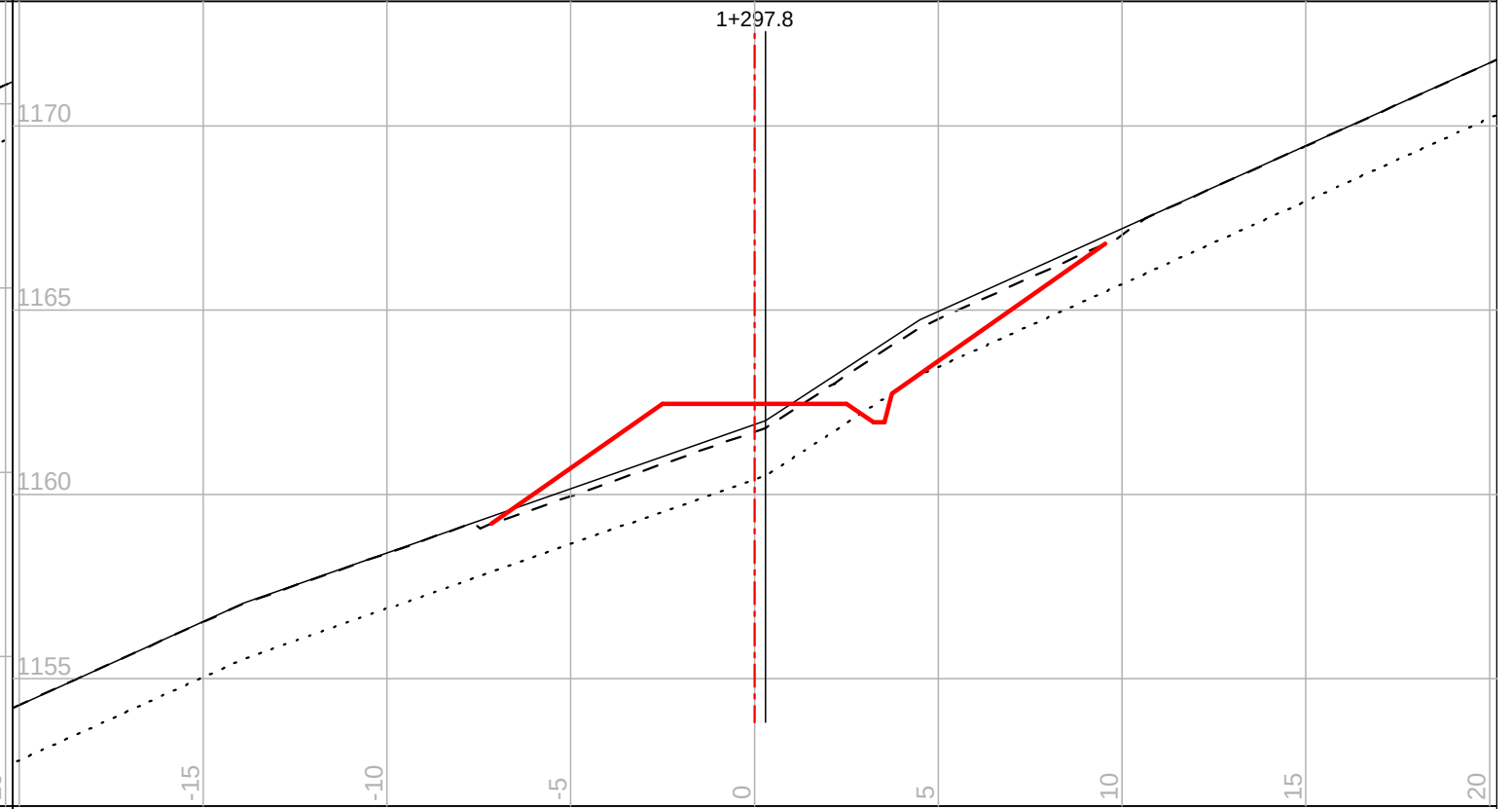
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L-Ssr:	46%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	0.6		
Index:	65	Cut Dp:	3.8	Stk L:	7.4	Stk R Y:	8.8		



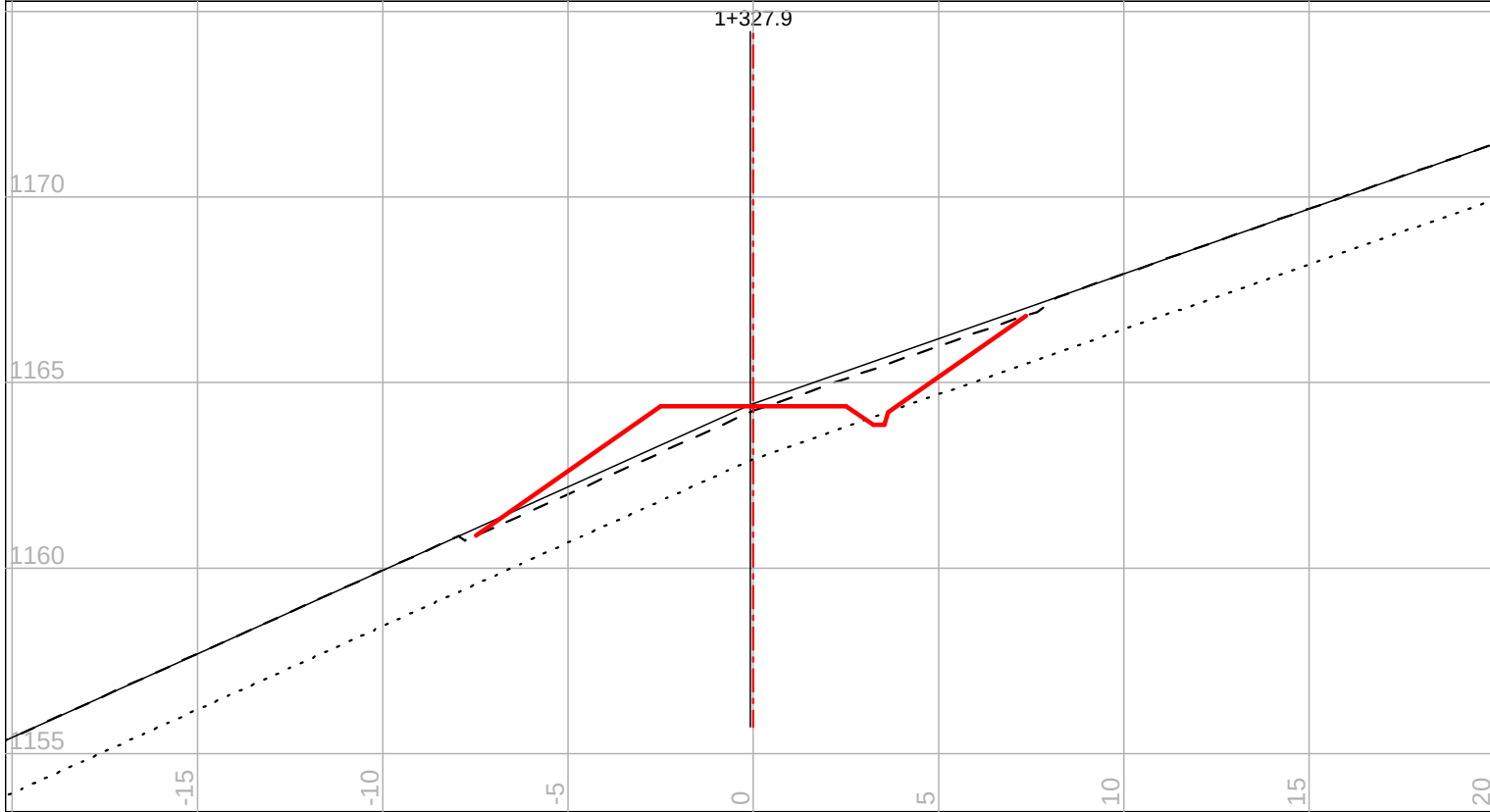
L-Ssl:	-45%	H. Offset:	0.6	Rd. Wd.:	5.0	Stk R:	10.6	CL Elev:	1159.2
L-Ssr:	45%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-2.1		
Index:	66	Cut Dp:	0.7	Stk L:	6.2	Stk R Y:	4.9		



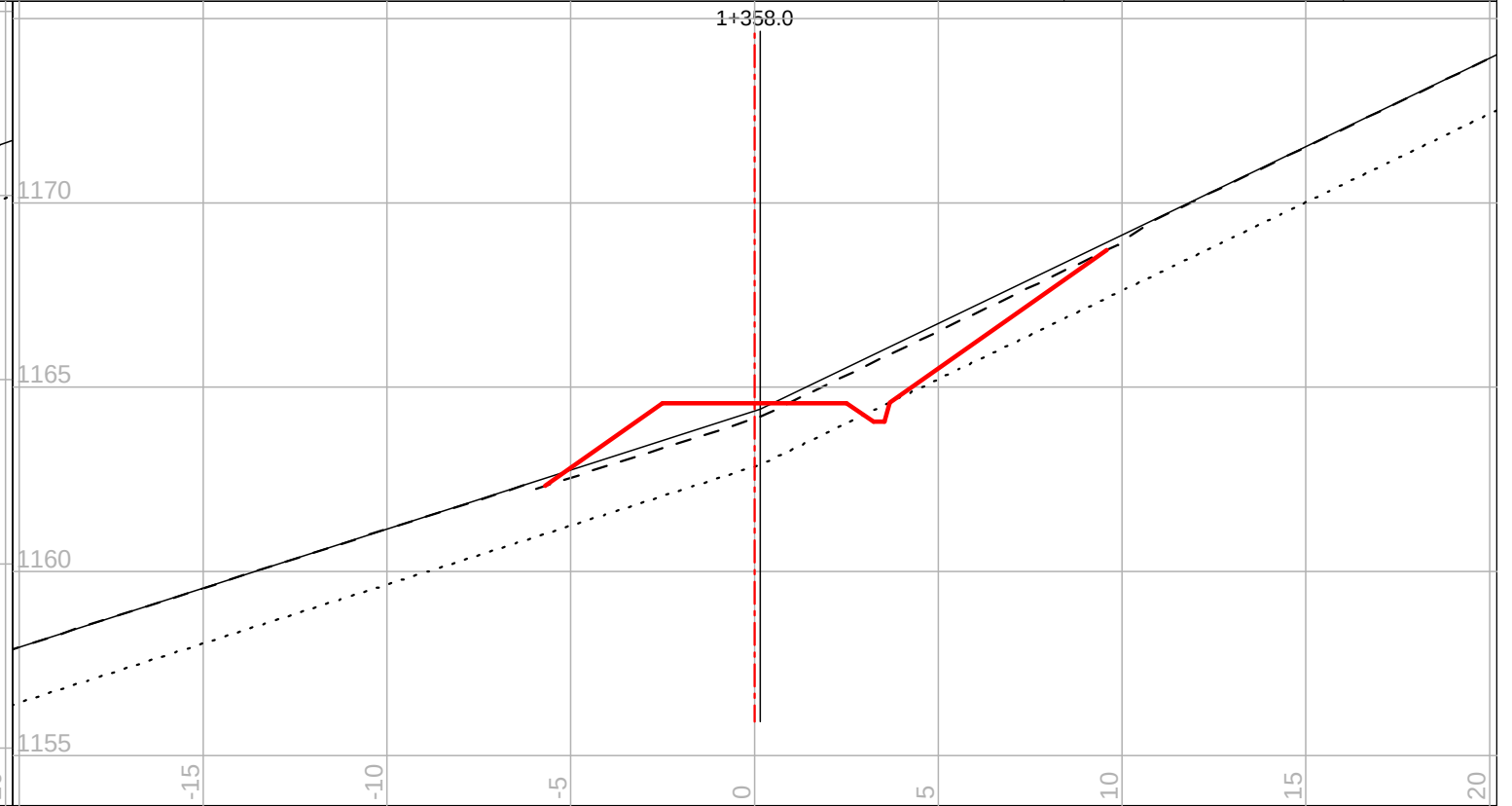
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L-Ssr:	46%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-3.8		
Index:	67	Cut Dp:	0.1	Stk L:	8.8	Stk R Y:	3.5		



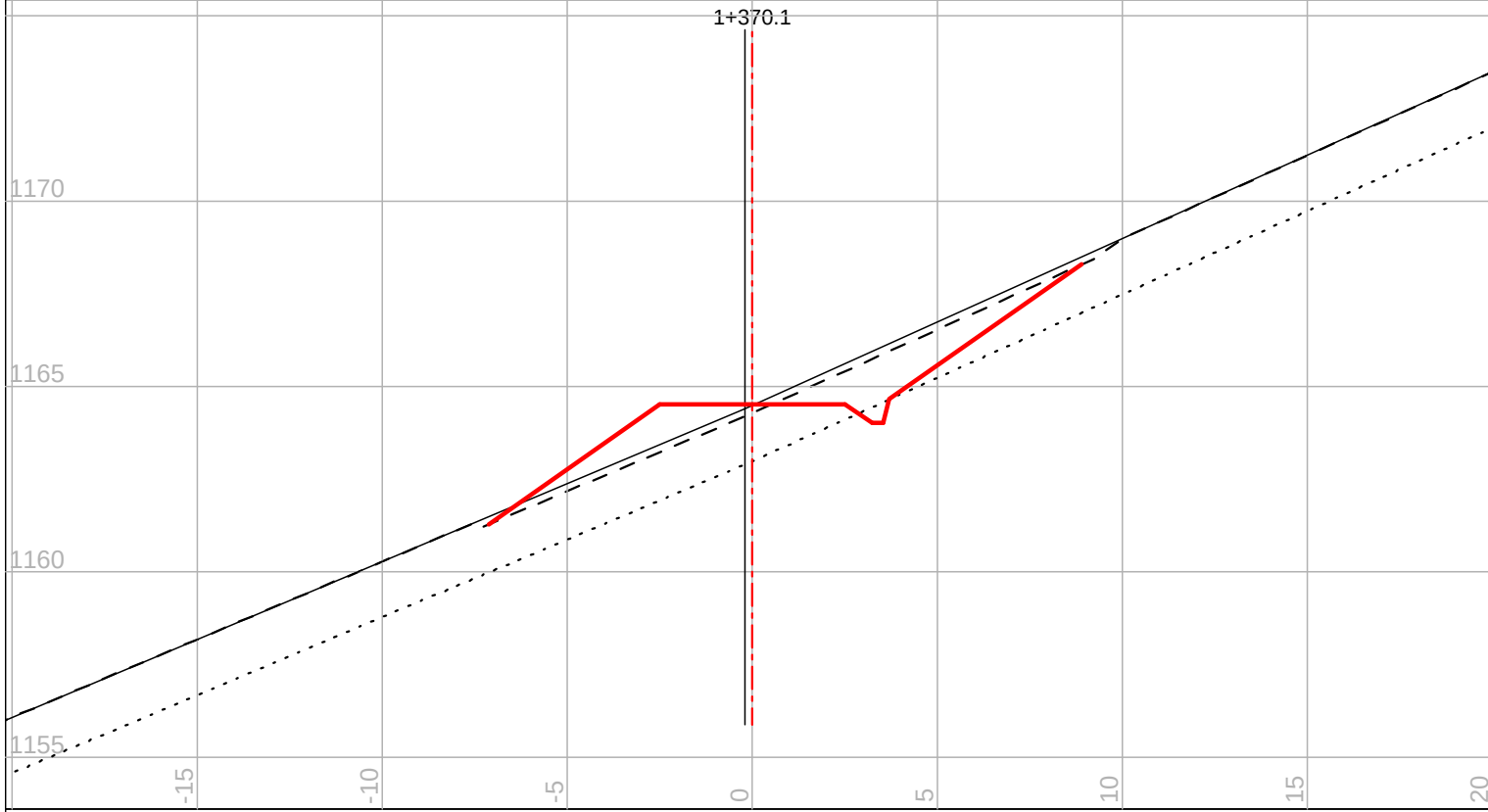
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L-Ssr:	35%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-3.3		
Index:	68	Cut Dp:	-0.6	Stk L:	7.7	Stk R Y:	4.3		



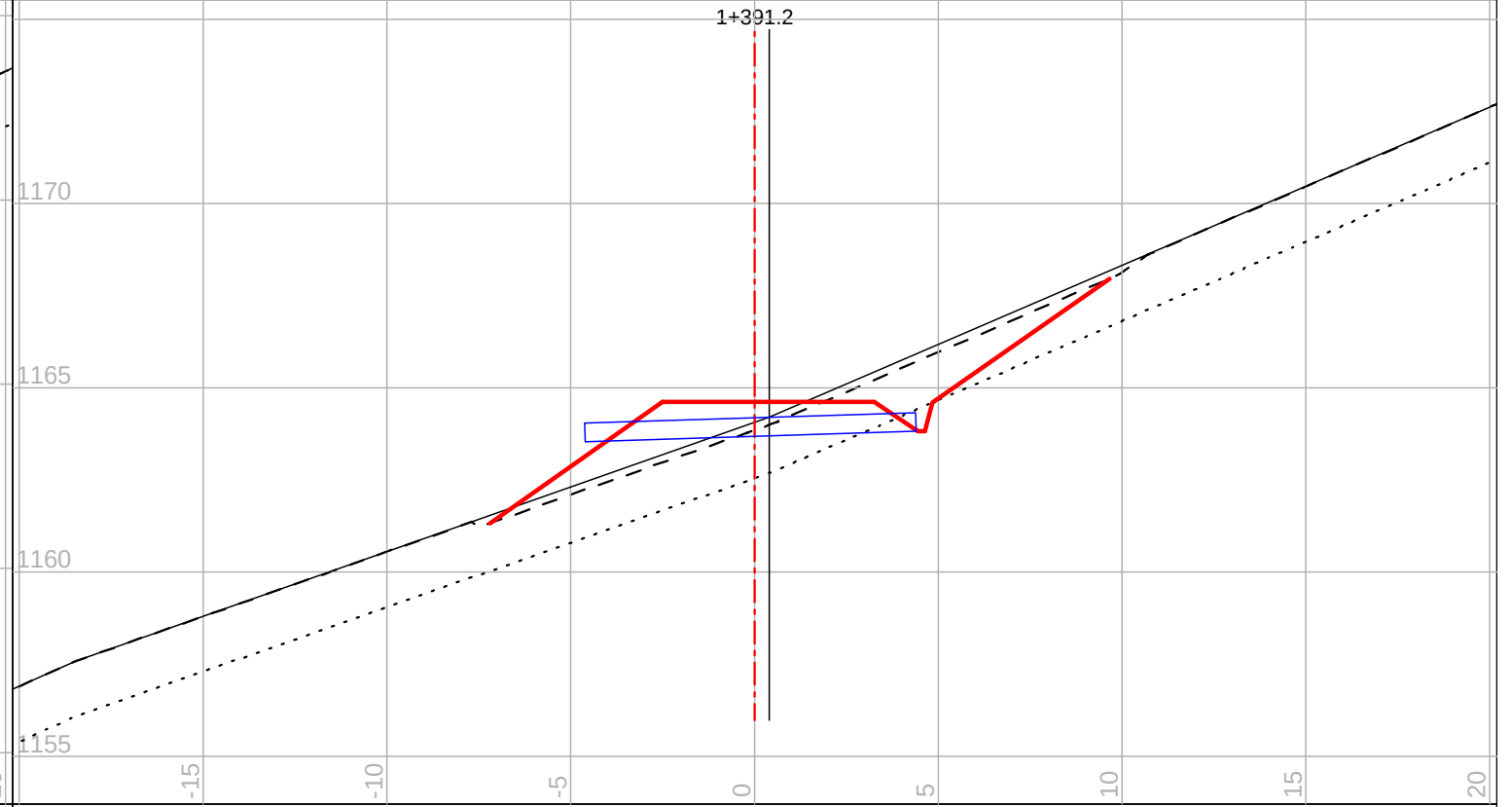
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L-Ssr:	35%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-3.5		
Index:	69	Cut Dp:	0.1	Stk L:	8.3	Stk R Y:	2.4		



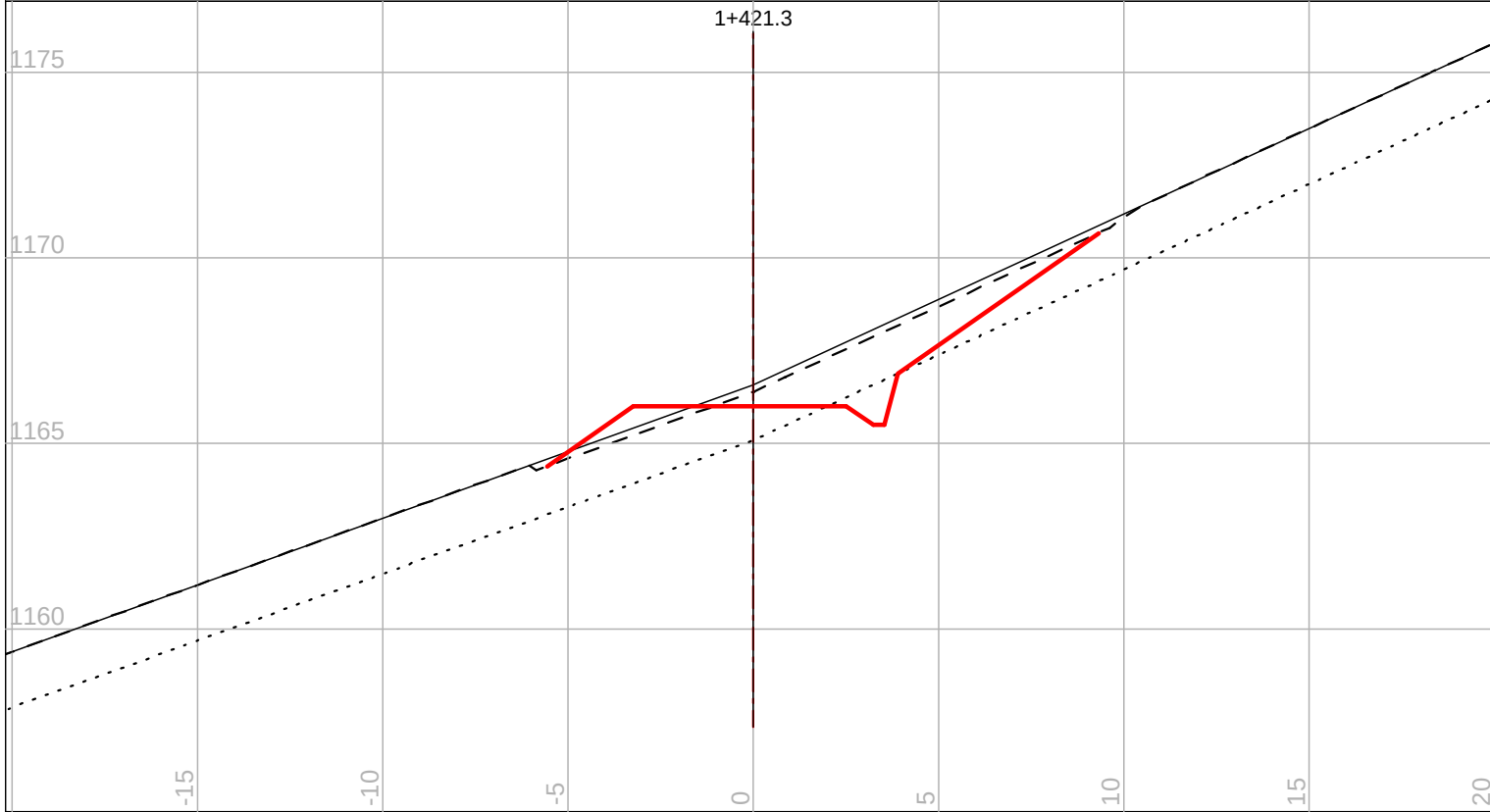
L-Ssl:	-32%	H. Offset:	-0.2	Rd. Wd.:	5.0	Stk R:	10.5	CL Elev:	1164.6
L-Ssr:	32%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-2.2		
Index:	70	Cut Dp:	-0.2	Stk L:	6.1	Stk R Y:	4.2		



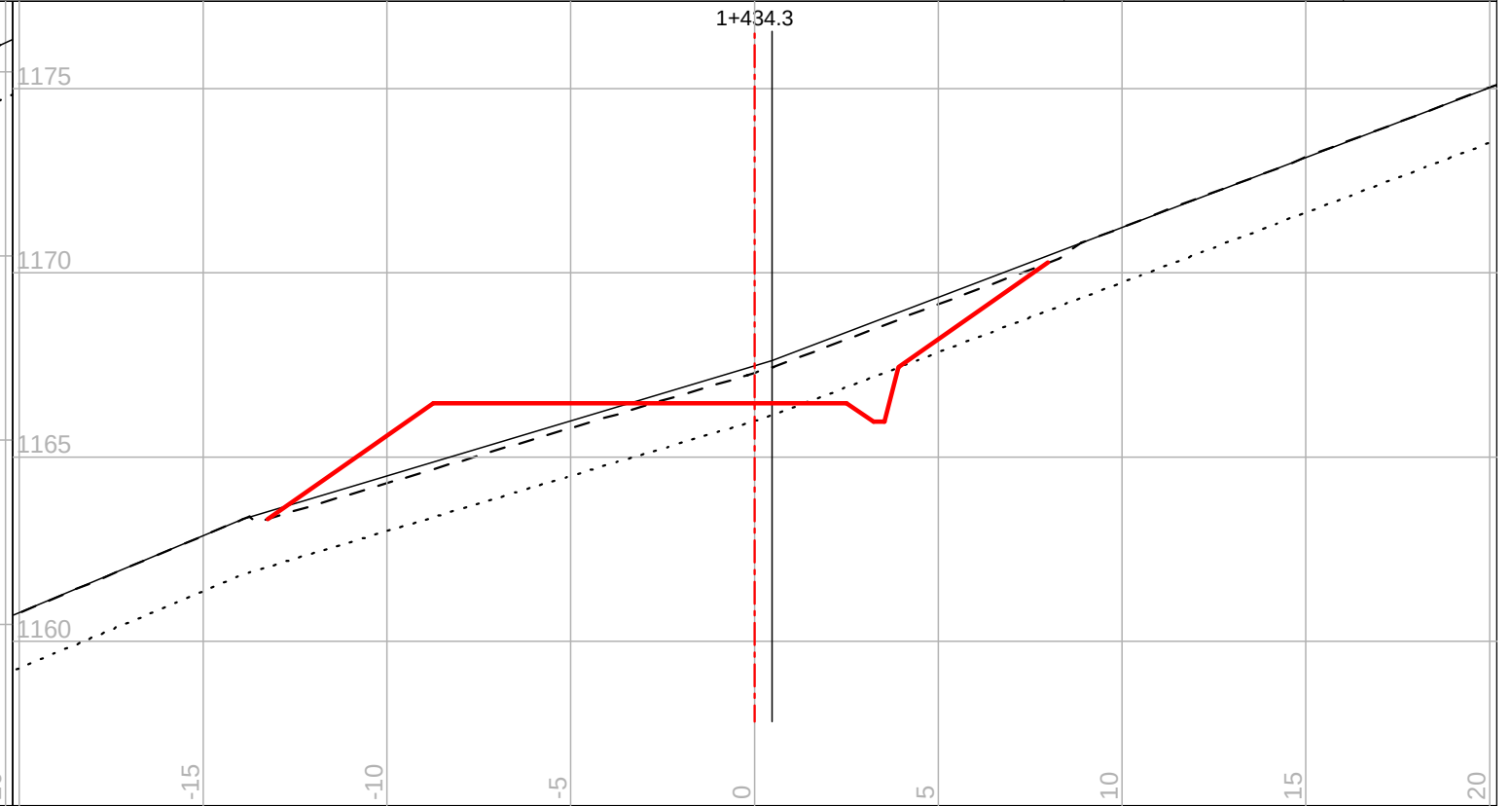
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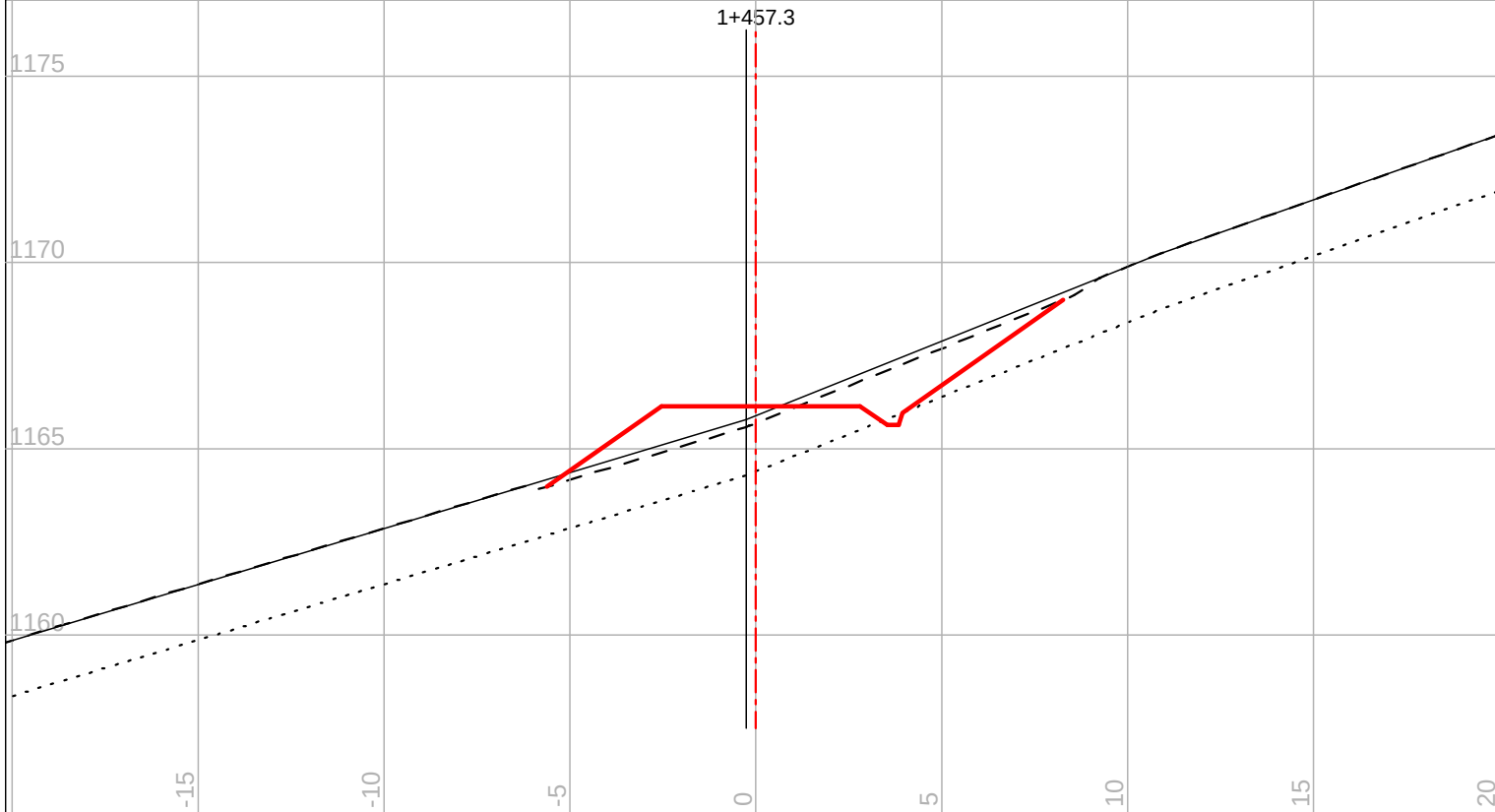
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L-Ssr:	35%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-3.3		
Index:	72	Cut Dp:	-0.6	Stk L:	7.7	Stk R Y:	3.3		



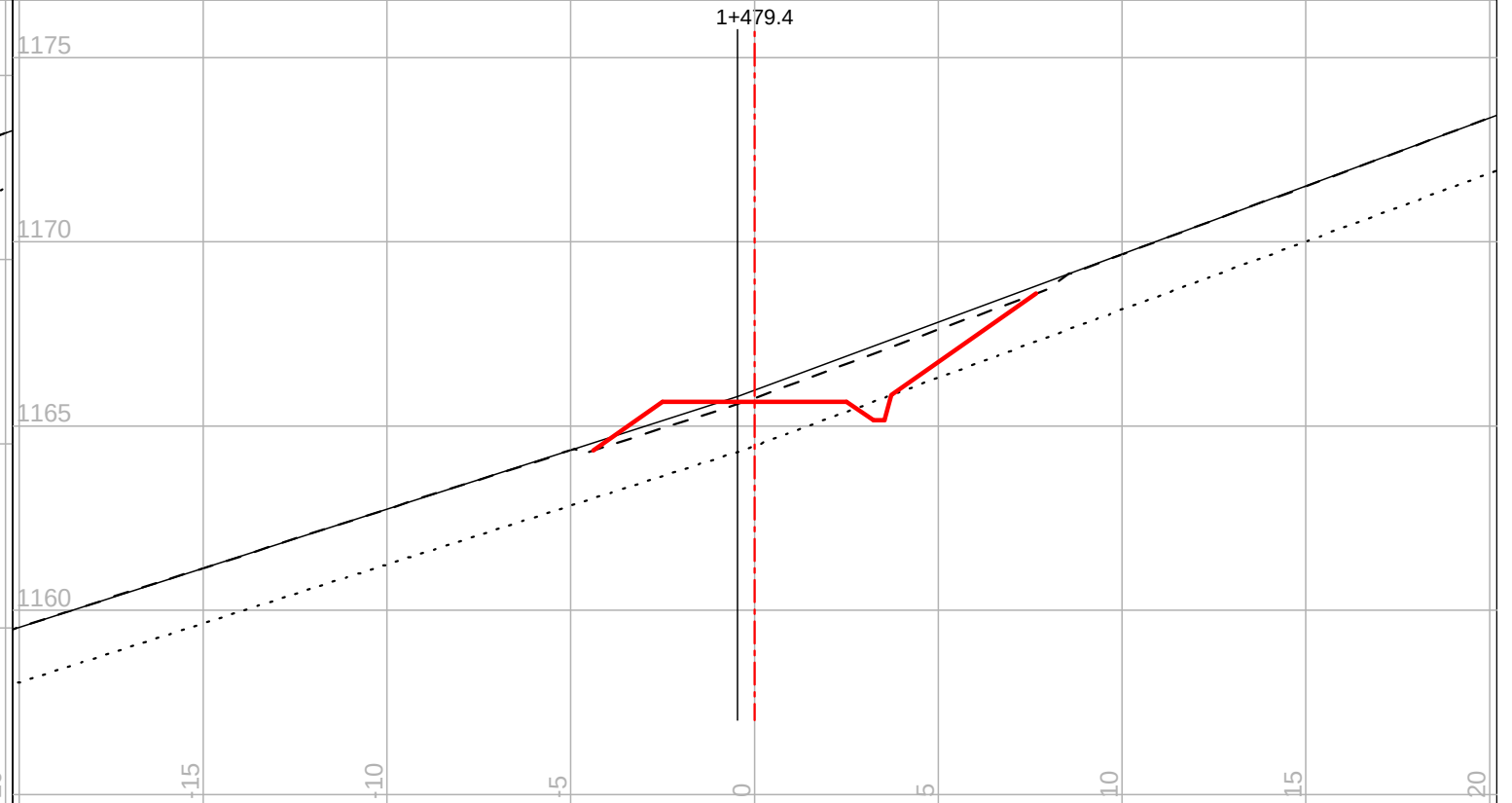
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Index:	73	Cut Dp:	0.6	Stk L:	6.0	Stk R Y:	4.7		



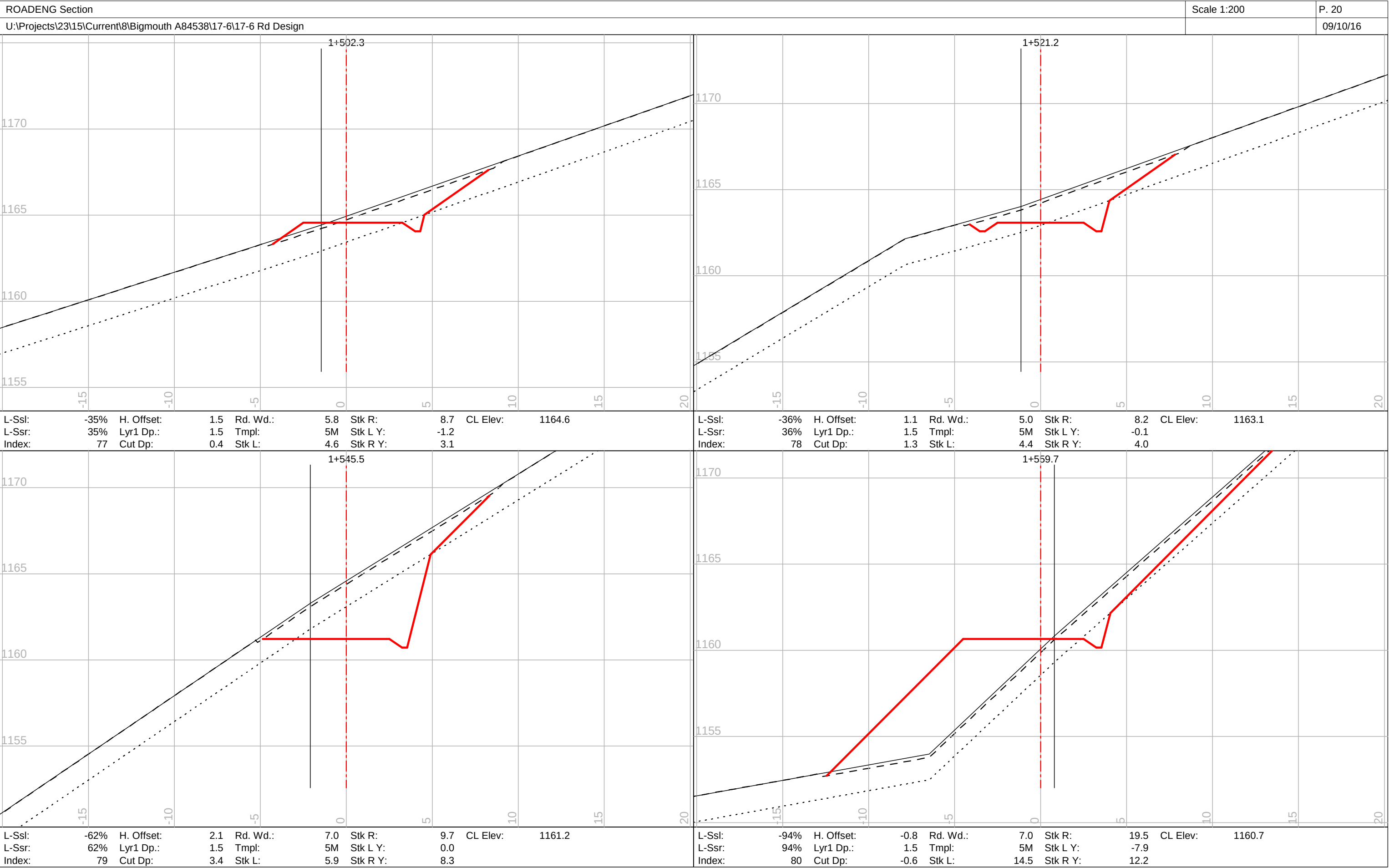
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L-Ssr:	30%	Lyr1 Dp.:	1.5	Tmpl:	TO<->5M	Stk L Y:	-3.1		
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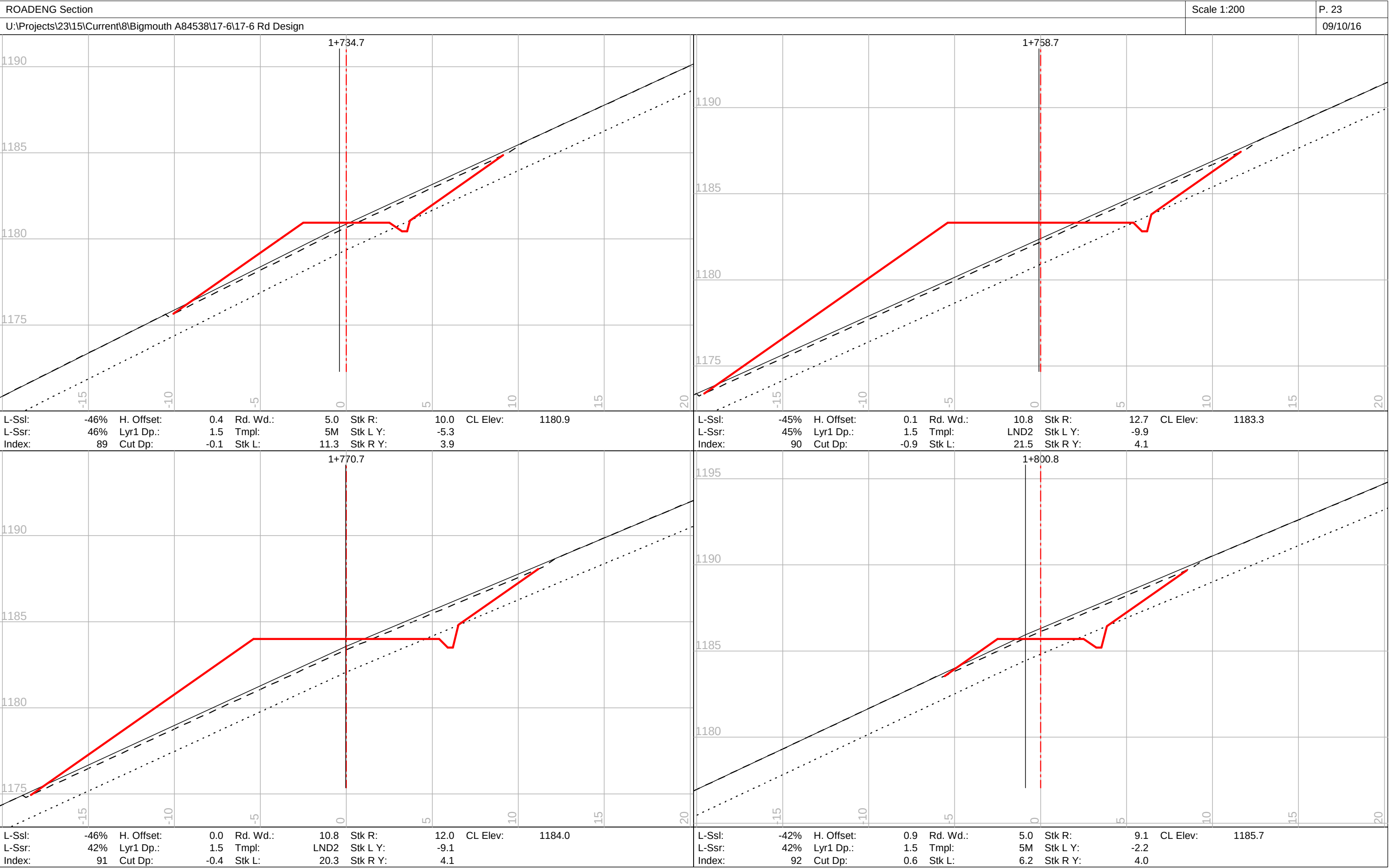


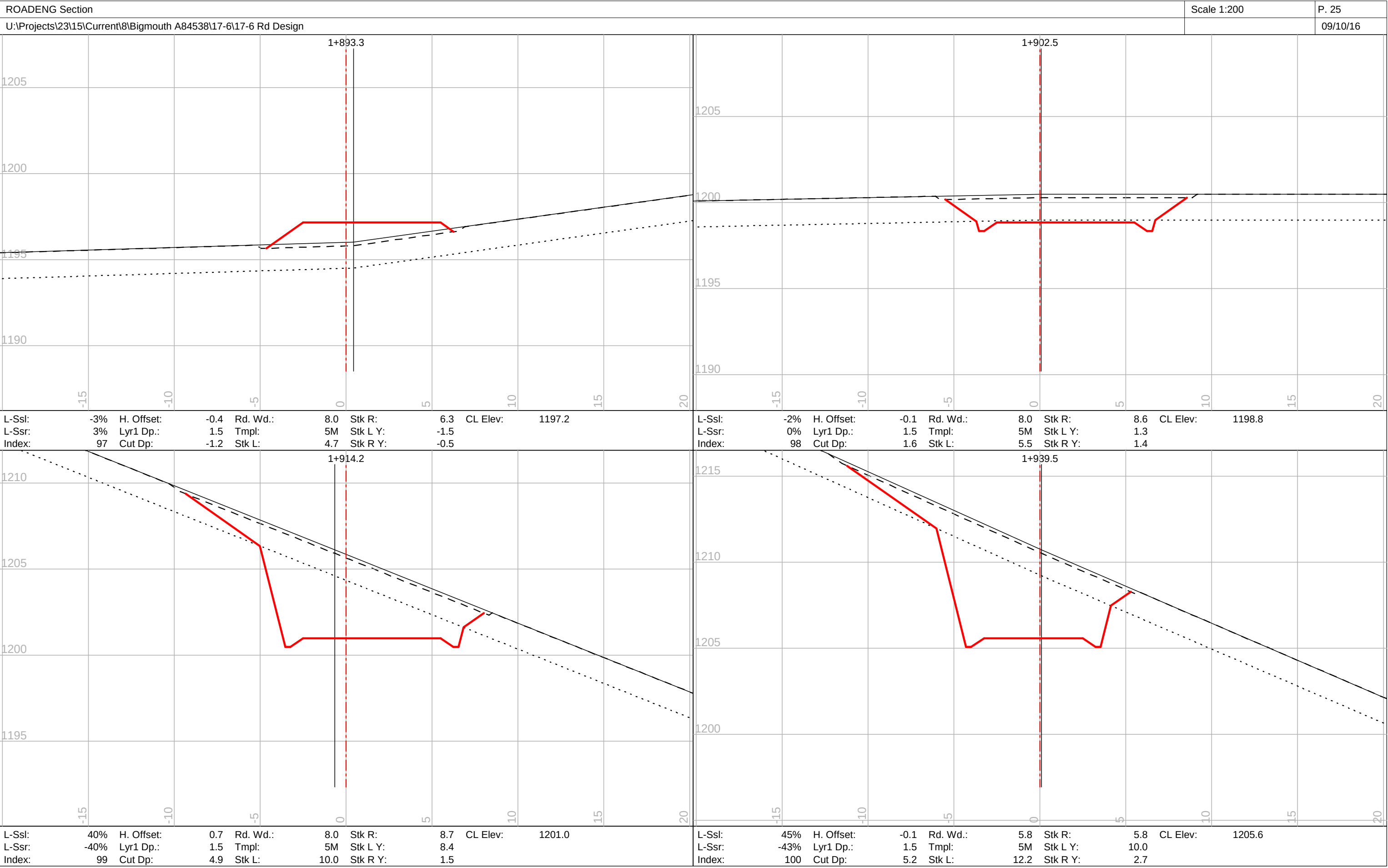
L-Ssl:	-40%	H. Offset:	0.3	Rd. Wd.:	5.3	Stk R:	8.8	CL Elev:	1166.1
L-Ssr:	40%	Lyr1 Dp.:	1.5	Tmpl:	TP<->5M	Stk L Y:	-2.2		
Index:	75	Cut Dp:	-0.3	Stk L:	5.9	Stk R Y:	2.9		

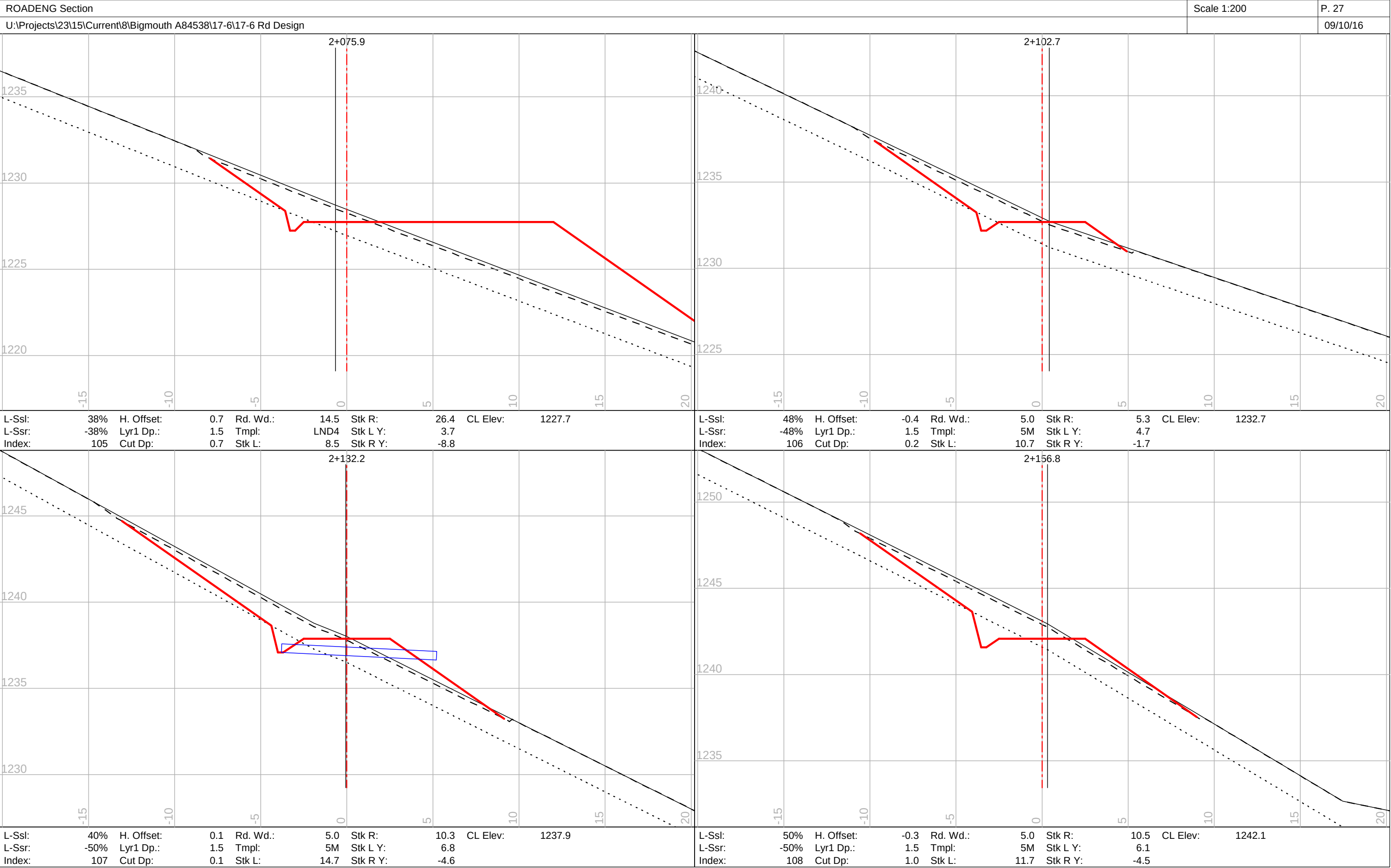


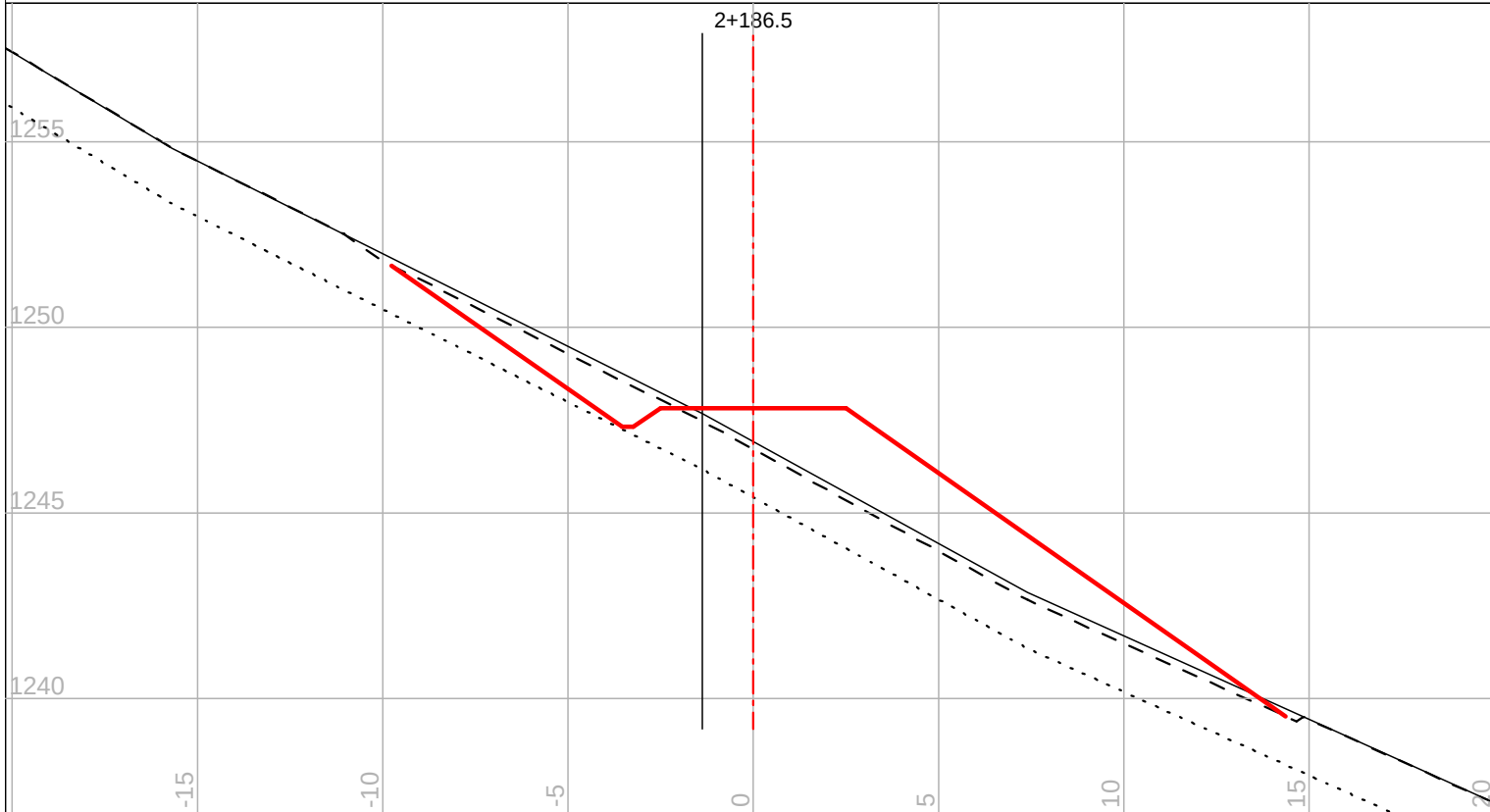
L-Ssl:	-37%	H. Offset:	0.5	Rd. Wd.:	5.0	Stk R:	8.1	CL Elev:	1165.7
L-Ssr:	37%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-1.3		
Index:	76	Cut Dp:	0.3	Stk L:	4.7	Stk R Y:	2.9		



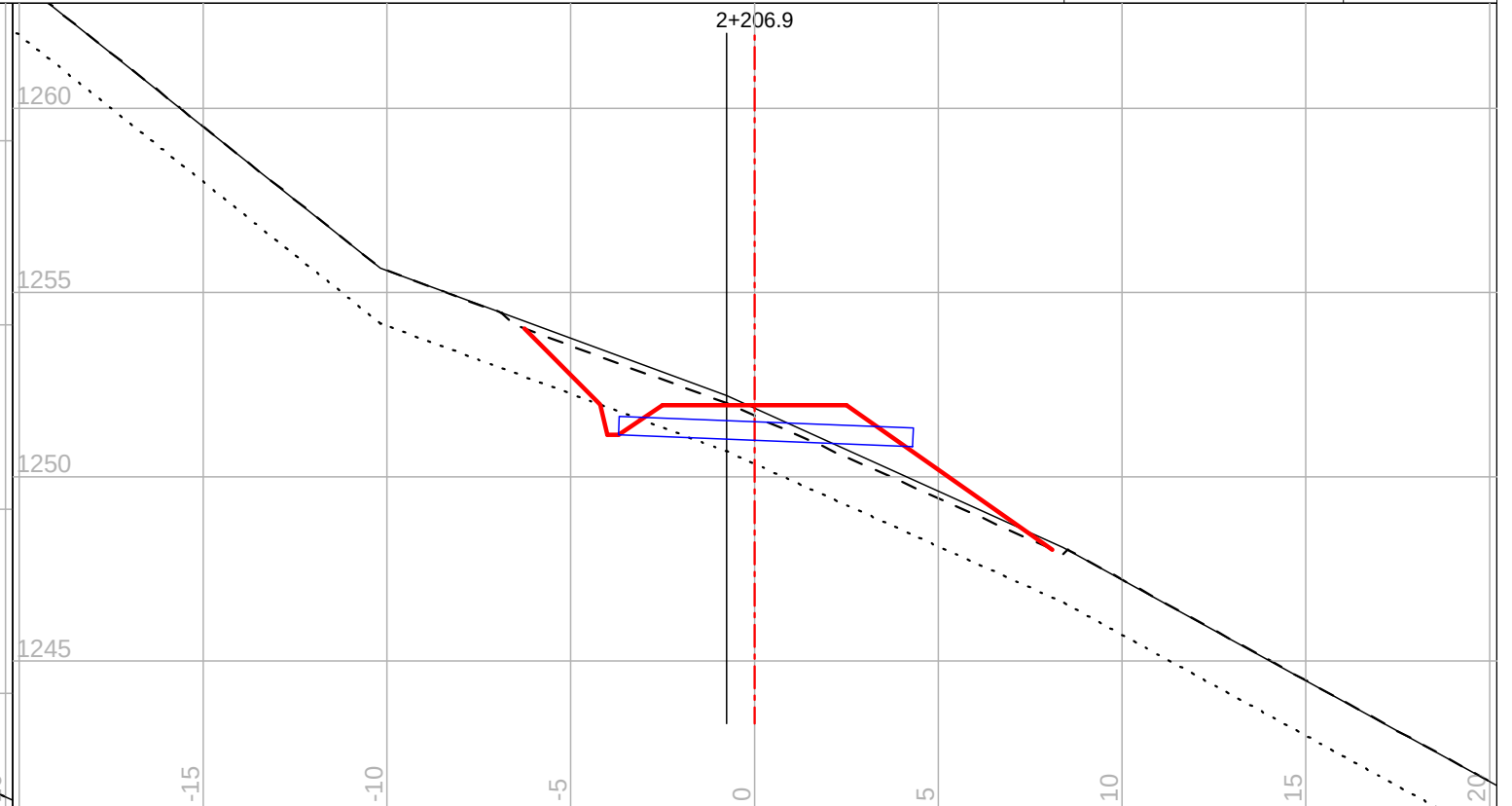




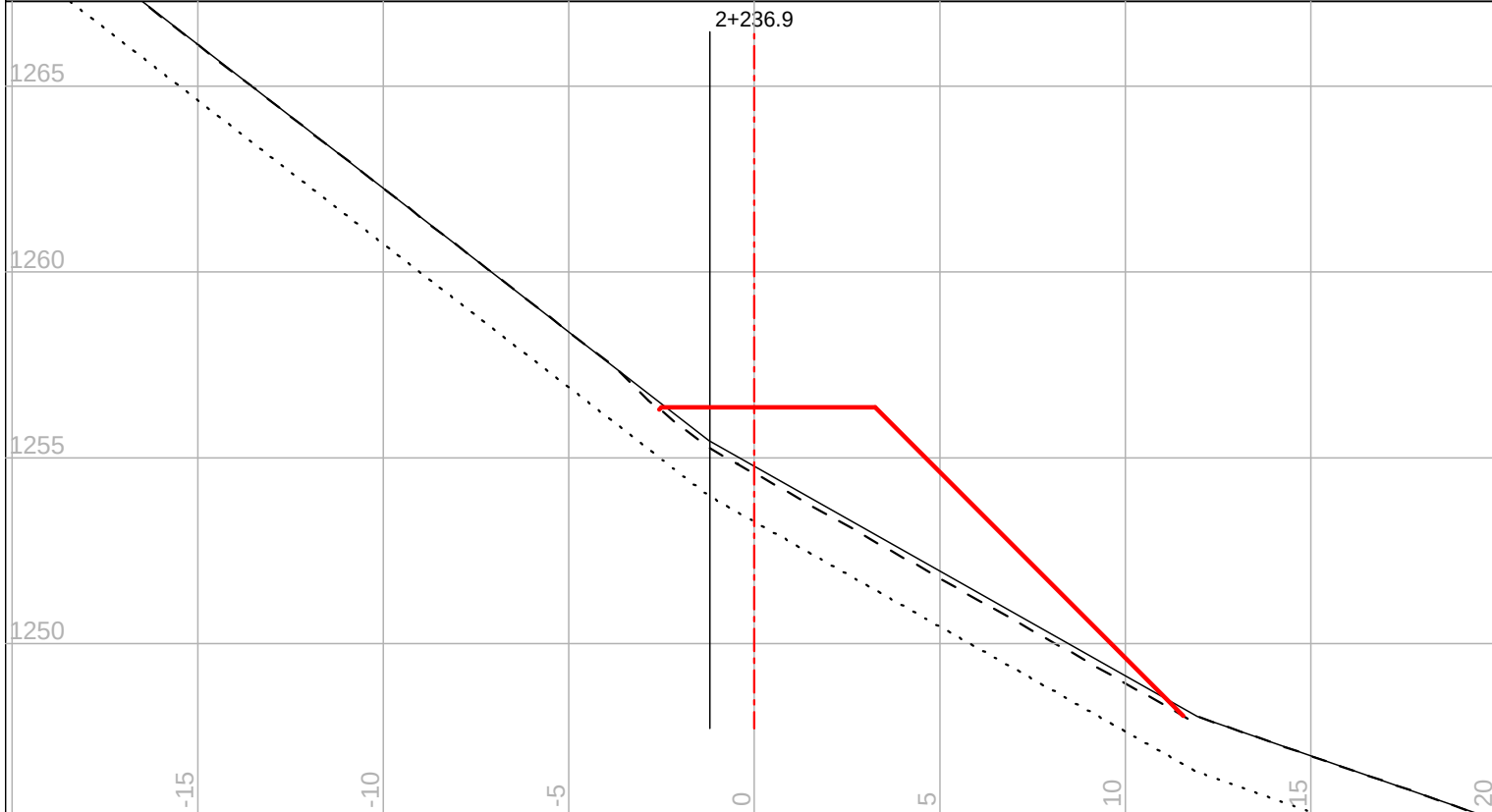




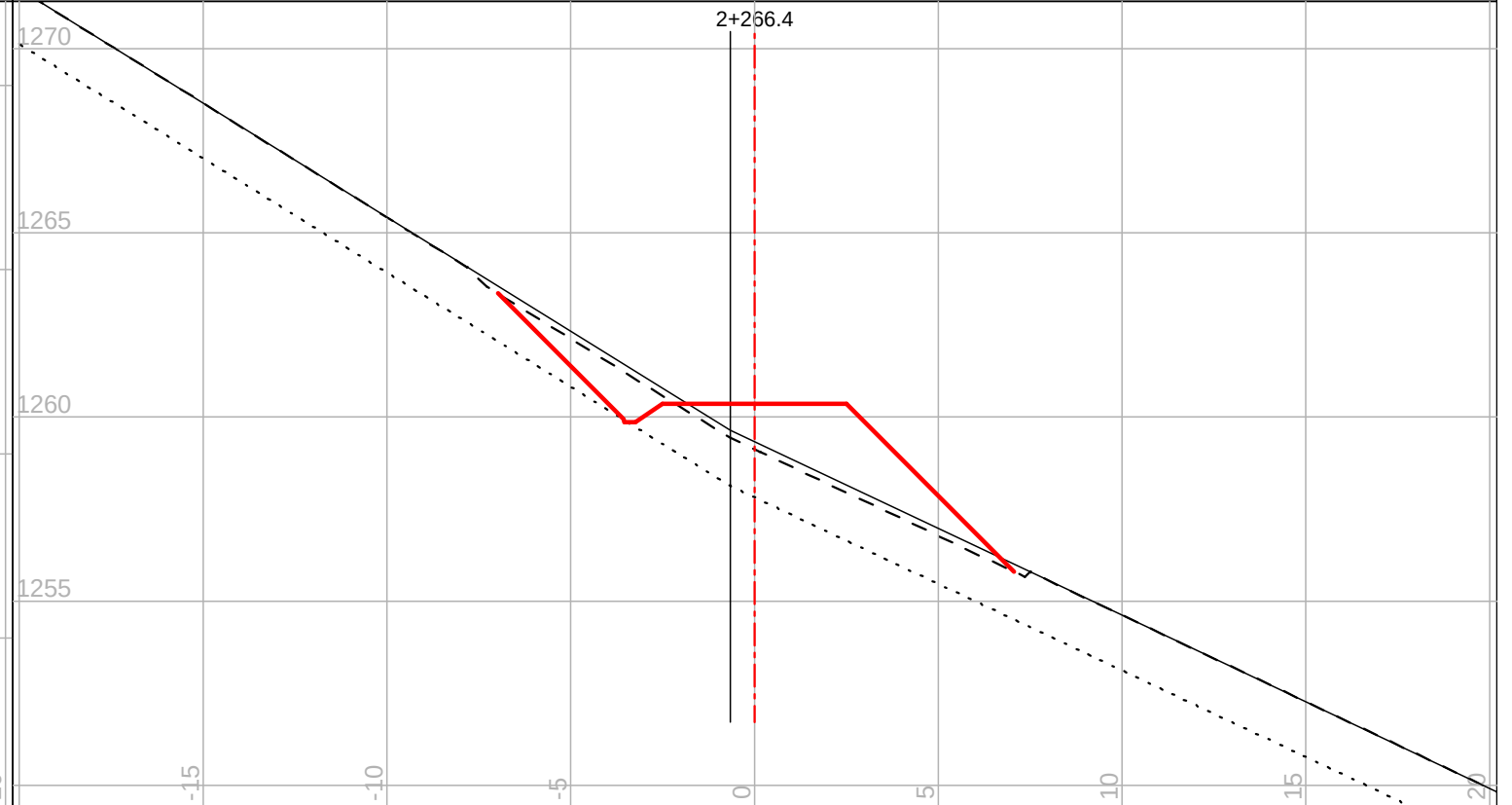
L-Ssl:	55%	H. Offset:	1.4	Rd. Wd.:	5.0	Stk R:	16.2	CL Elev:	1247.8
L-Ssr:	-55%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	3.8		
Index:	109	Cut Dp:	-0.9	Stk L:	10.9	Stk R Y:	-8.3		



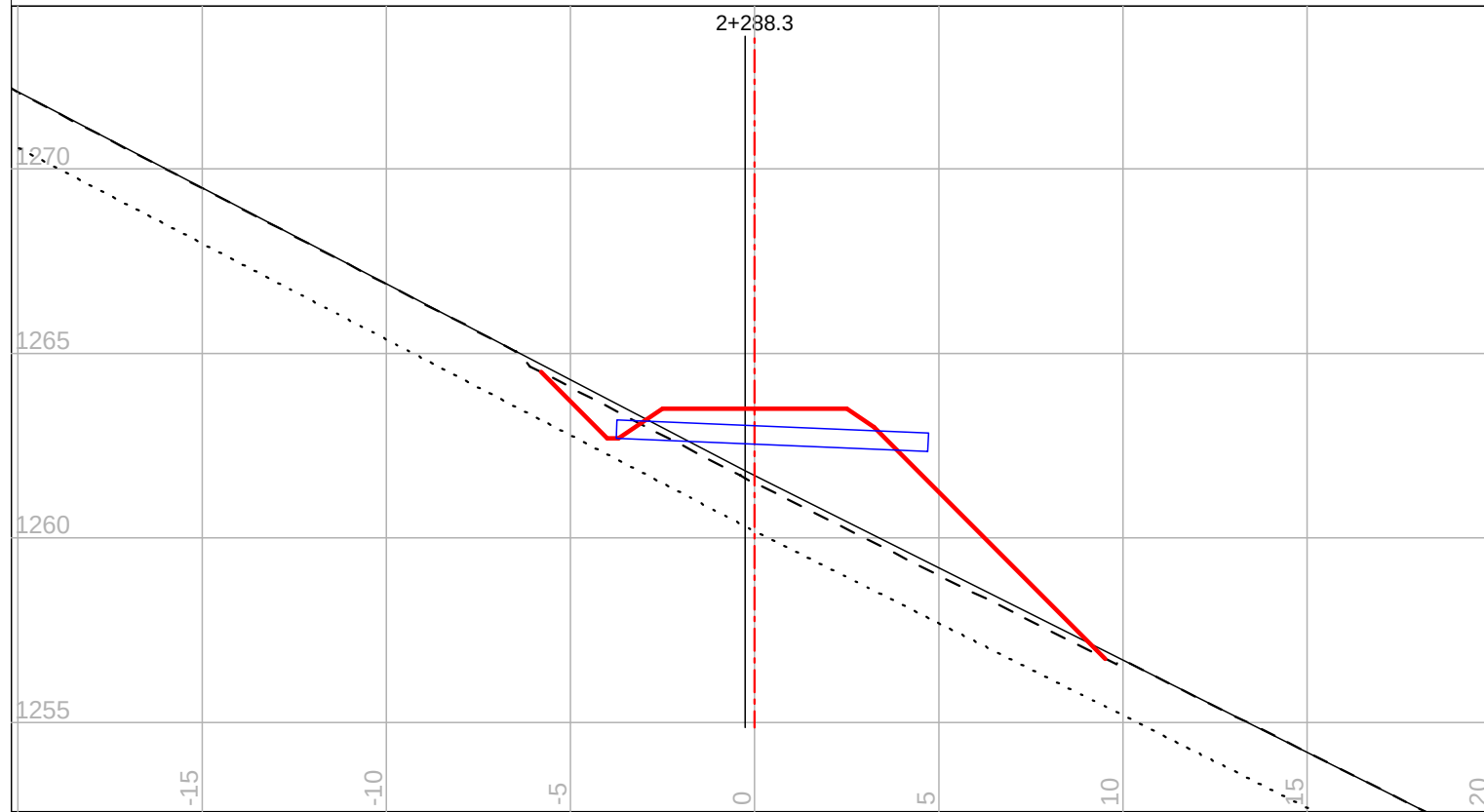
L-Ssl:	45%	H. Offset:	0.8	Rd. Wd.:	5.0	Stk R:	9.0	CL Elev:	1251.9
L-Ssr:	-45%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	2.1		
Index:	110	Cut Dp:	-0.1	Stk L:	6.6	Stk R Y:	-3.9		



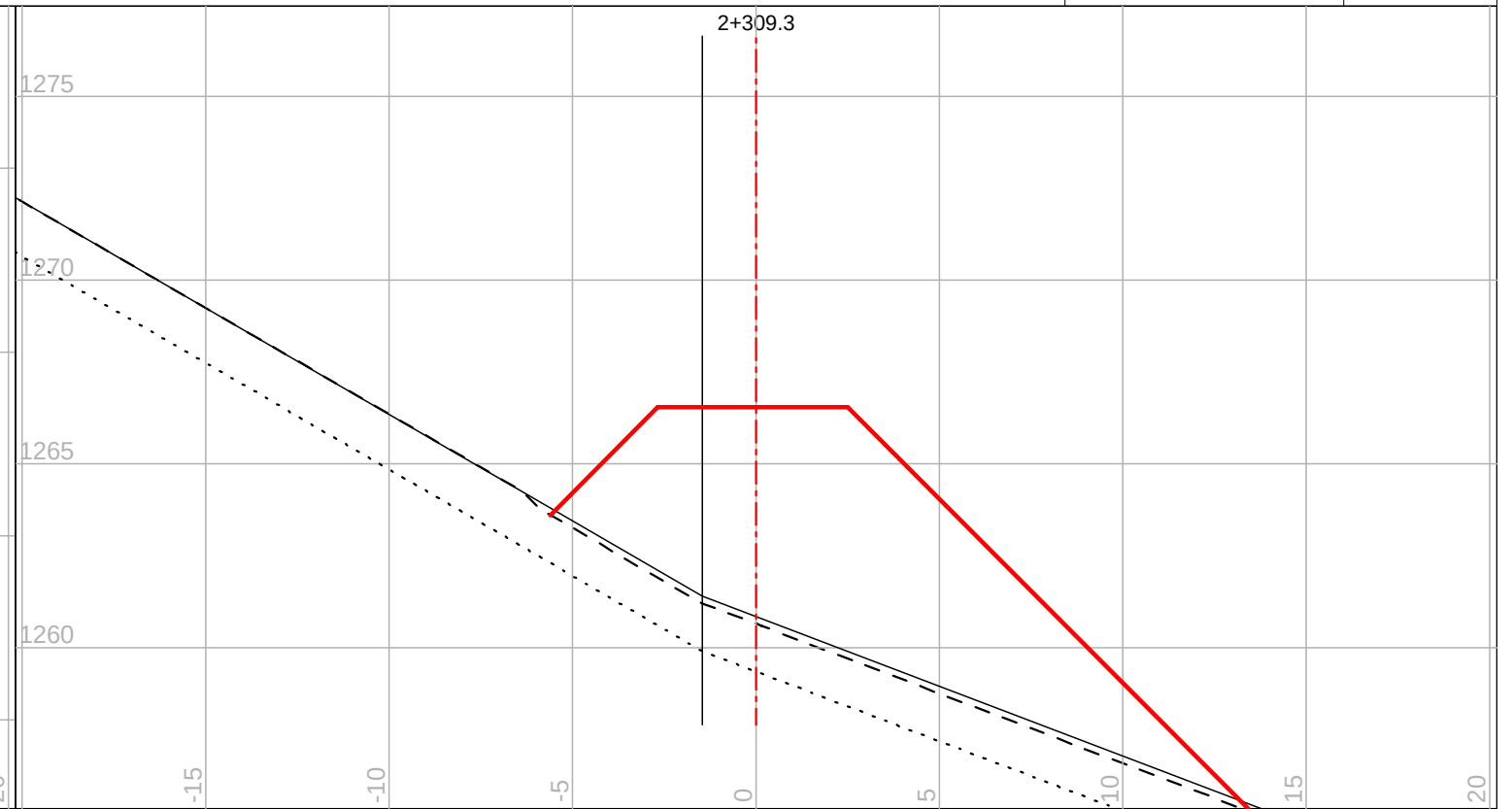
L-Ssl:	56%	H. Offset:	1.2	Rd. Wd.:	5.8	Stk R:	13.4	CL Elev:	1256.4
L-Ssr:	-56%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-0.1		
Index:	111	Cut Dp:	-1.6	Stk L:	3.0	Stk R Y:	-8.3		



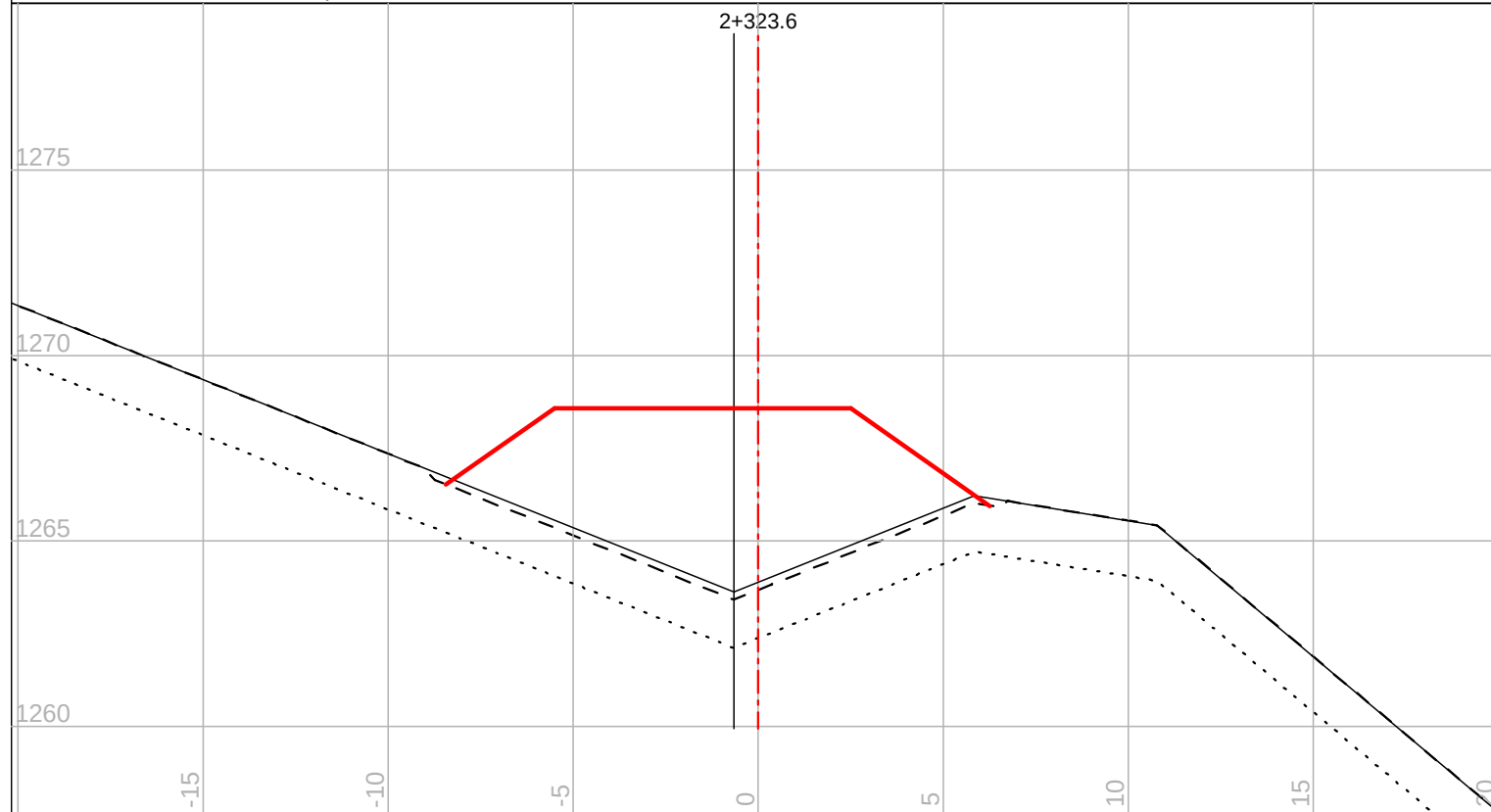
L-Ssl:	47%	H. Offset:	0.7	Rd. Wd.:	5.0	Stk R:	7.9	CL Elev:	1260.4
L-Ssr:	-47%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	3.0		
Index:	112	Cut Dp:	-1.0	Stk L:	8.1	Stk R Y:	-4.6		



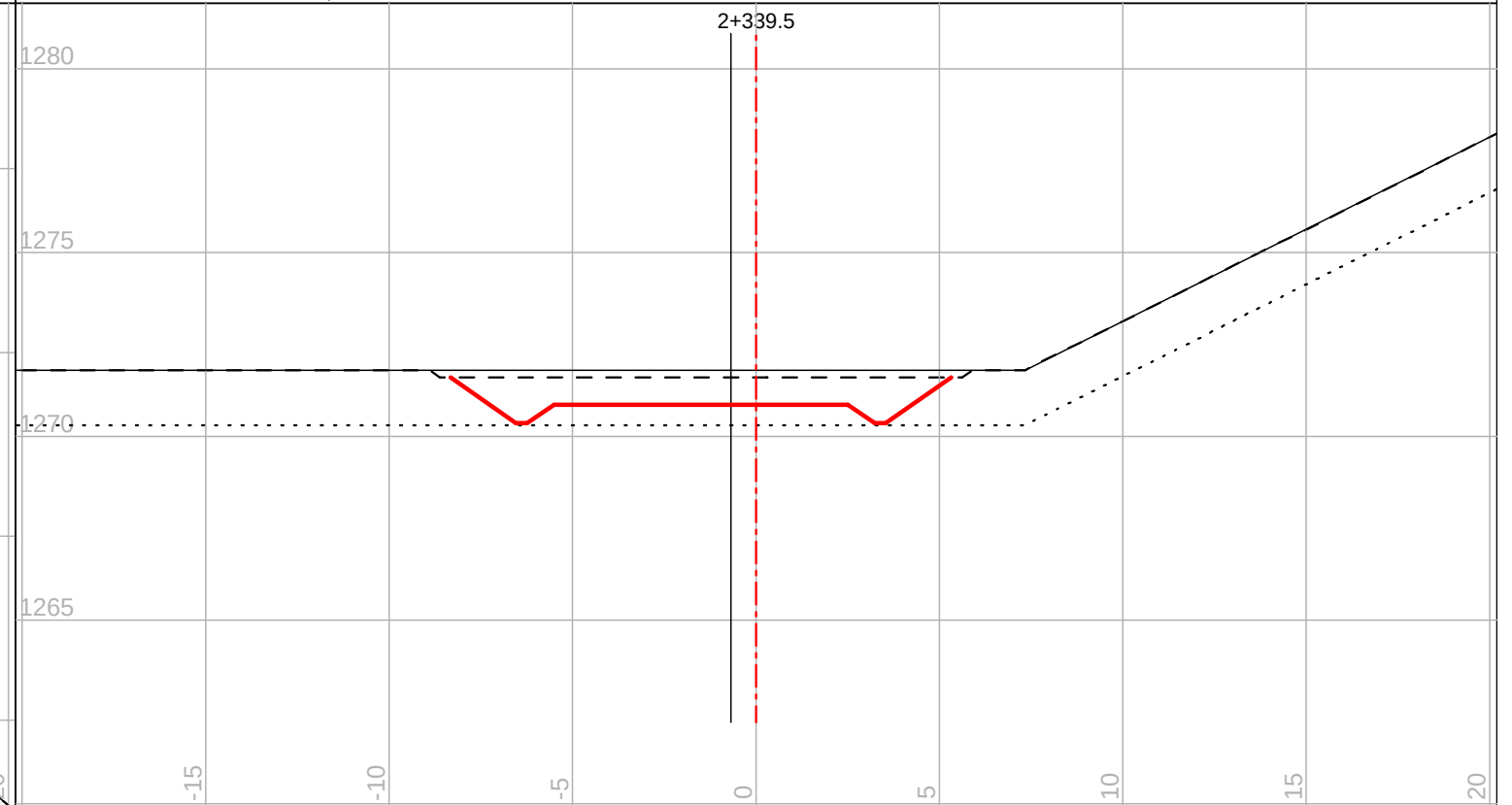
L-Ssl:	50%	H. Offset:	0.3	Rd. Wd.:	5.0	Stk R:	10.7	CL Elev:	1263.5
L-Ssr:	-50%	Lyr1 Dp.:	1.5	Tmpl:	5MI	Stk L Y:	1.0		
Index:	113	Cut Dp:	-1.8	Stk L:	6.4	Stk R Y:	-6.8		



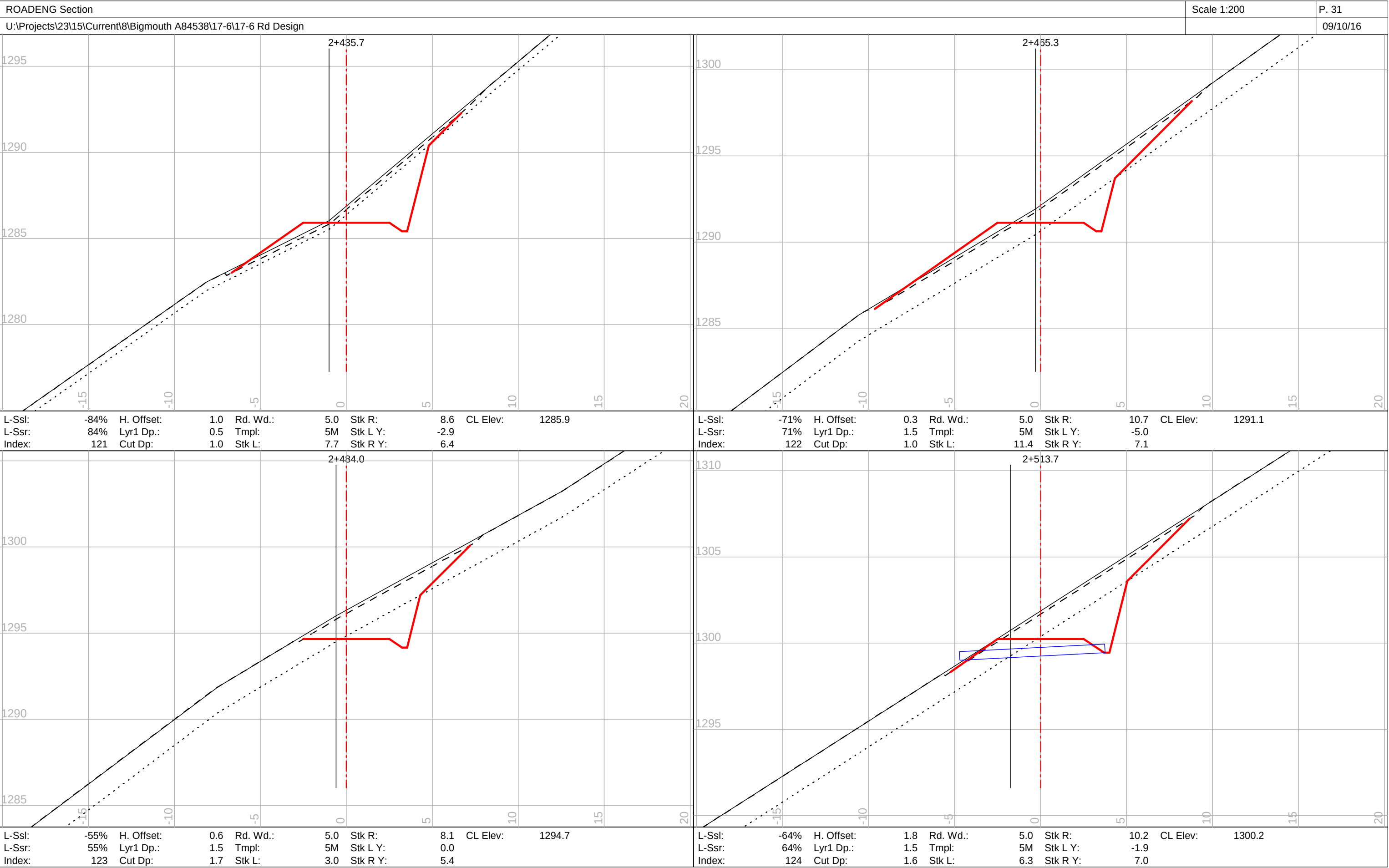
L-Ssl:	38%	H. Offset:	1.5	Rd. Wd.:	5.2	Stk R:	14.5	CL Elev:	1266.5
L-Ssr:	-38%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-2.9		
Index:	114	Cut Dp:	-5.7	Stk L:	6.2	Stk R Y:	-11.0		

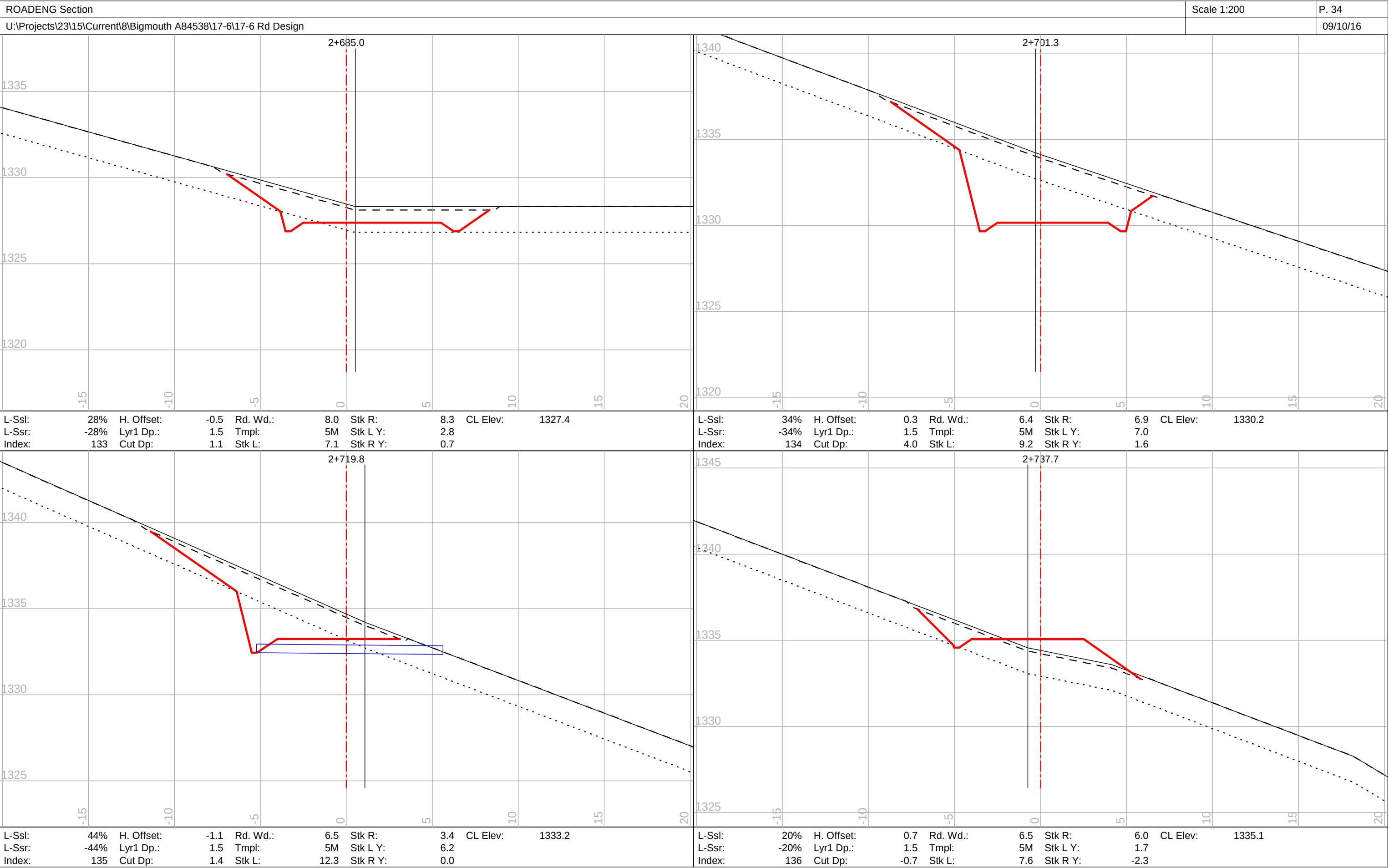


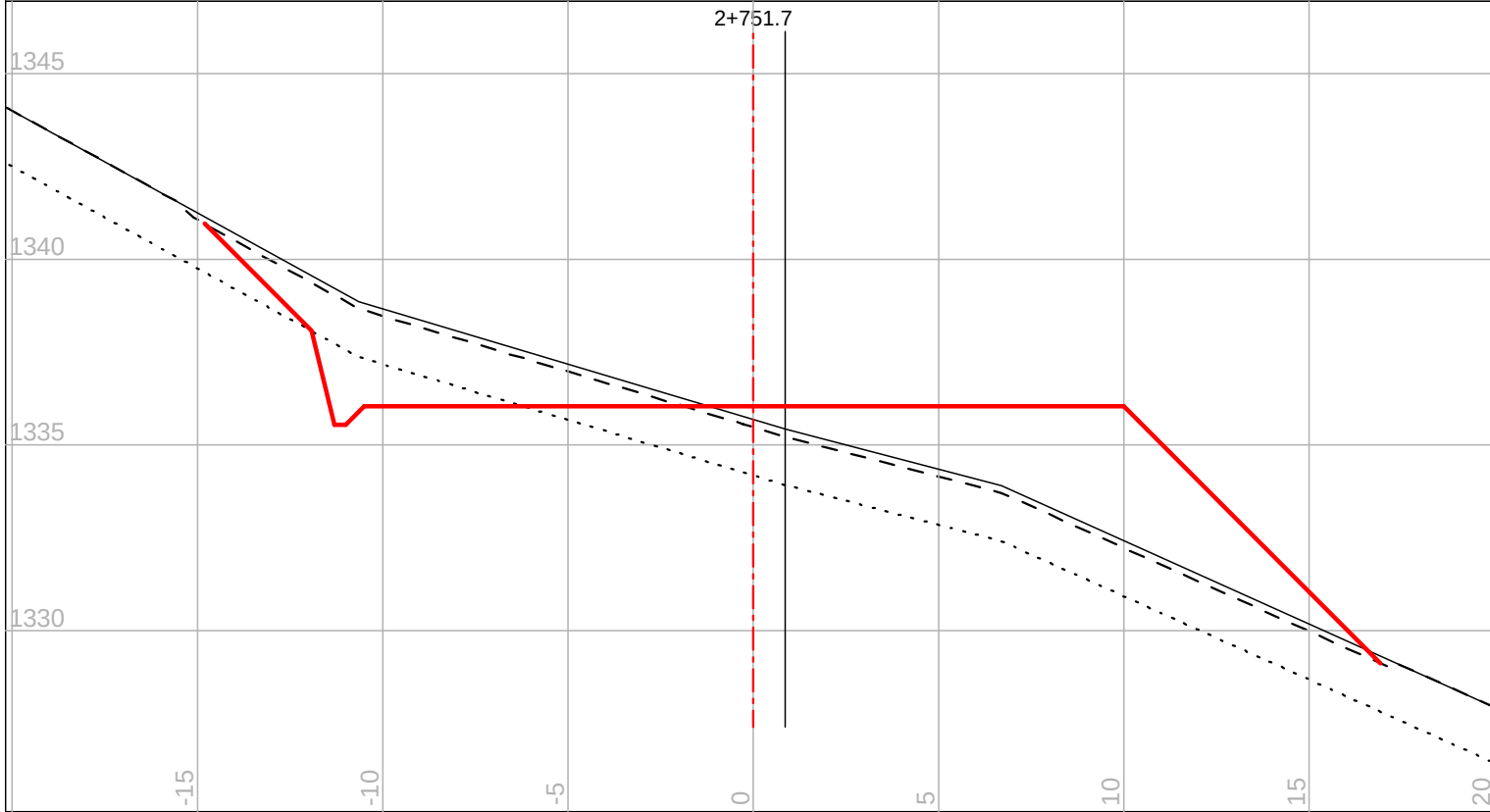
L-Ssl:	-40%	H. Offset:	0.7	Rd. Wd.:	8.0	Stk R:	6.6	CL Elev:	1268.6
L-Ssr:	40%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	-2.1		
Index:	115	Cut Dp:	-4.7	Stk L:	8.8	Stk R Y:	-2.6		



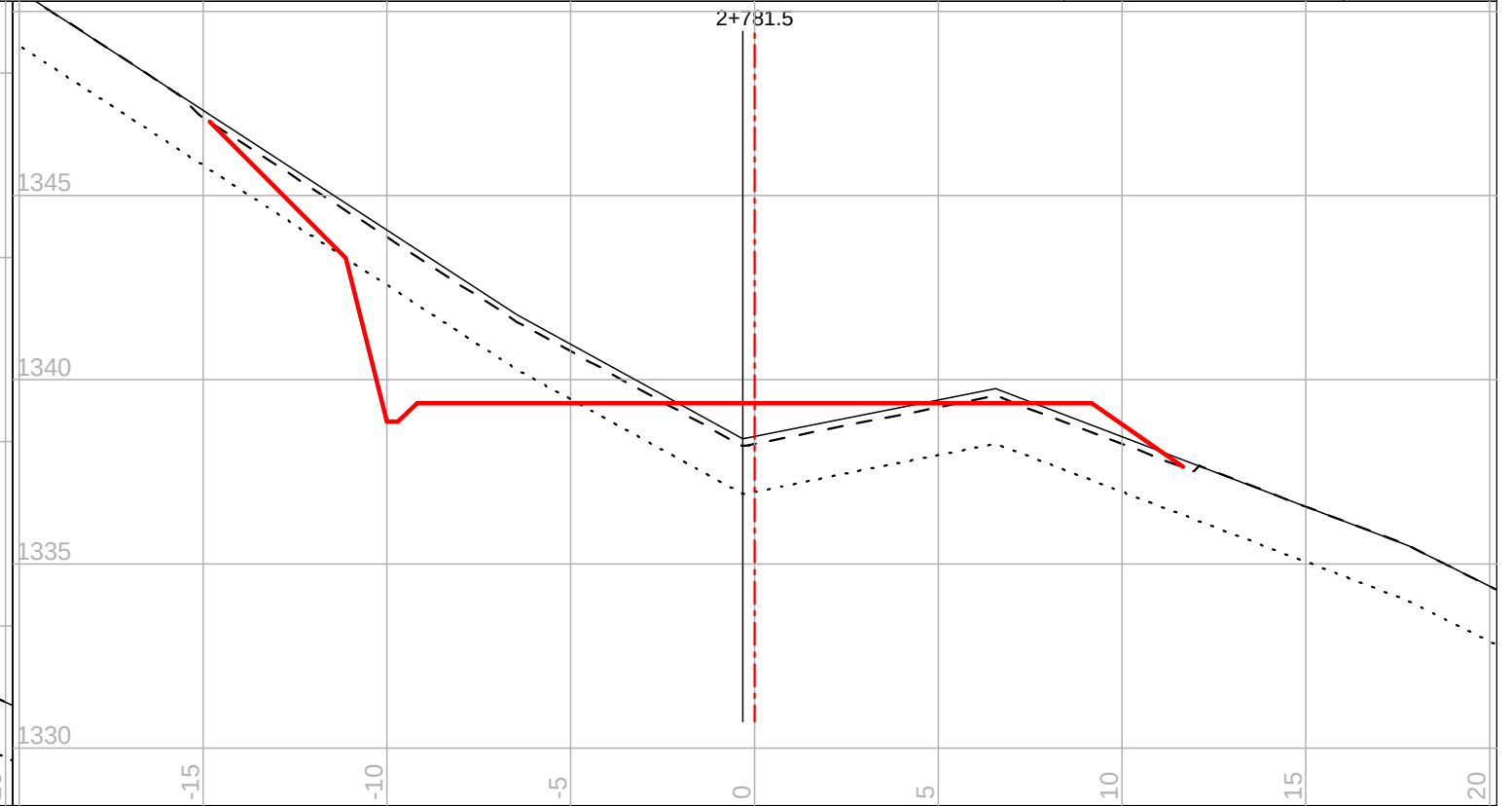
L-Ssl:	0%	H. Offset:	0.7	Rd. Wd.:	8.0	Stk R:	5.3	CL Elev:	1270.9
L-Ssr:	0%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	0.7		
Index:	116	Cut Dp:	0.9	Stk L:	8.3	Stk R Y:	0.7		



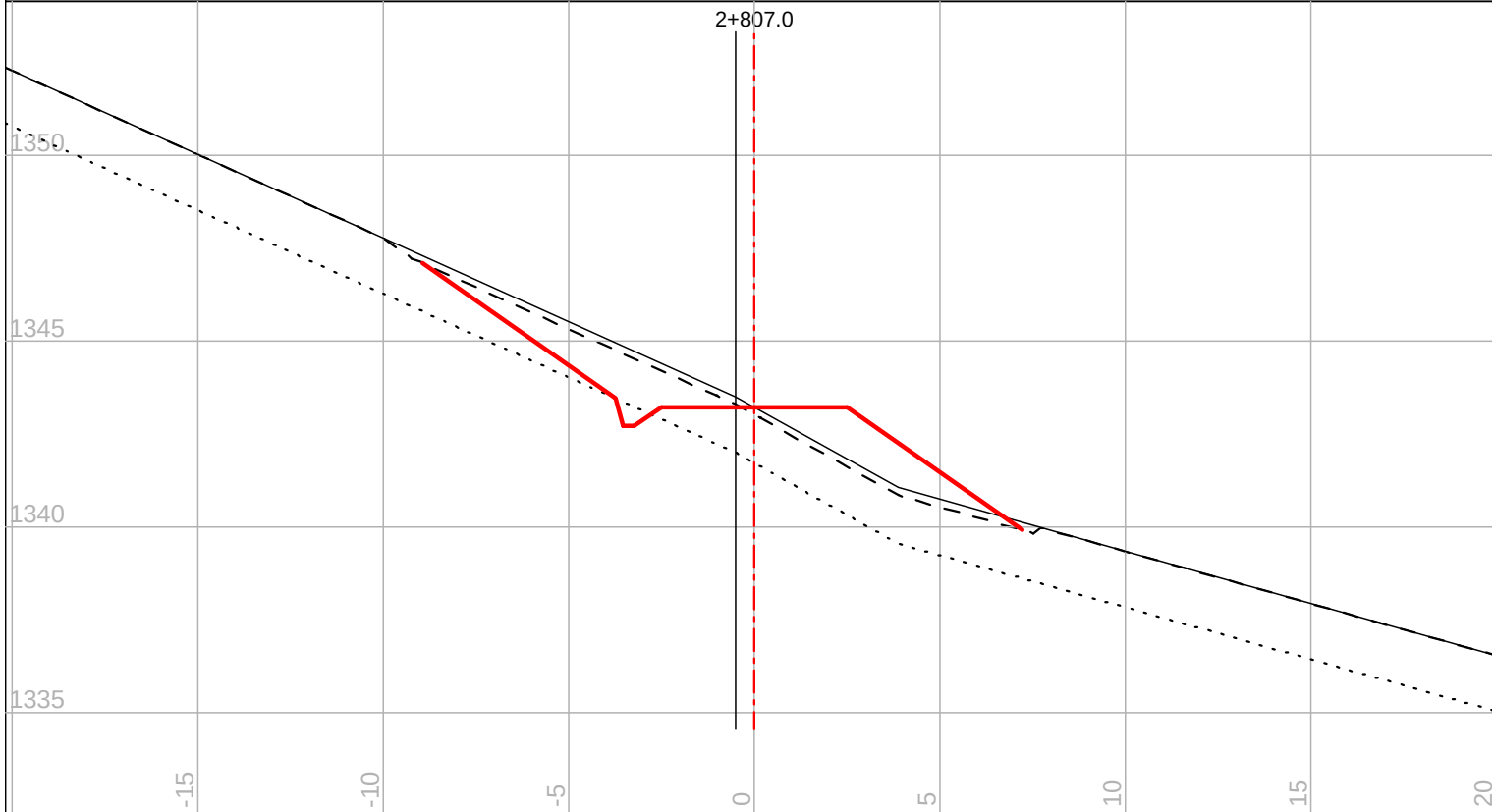




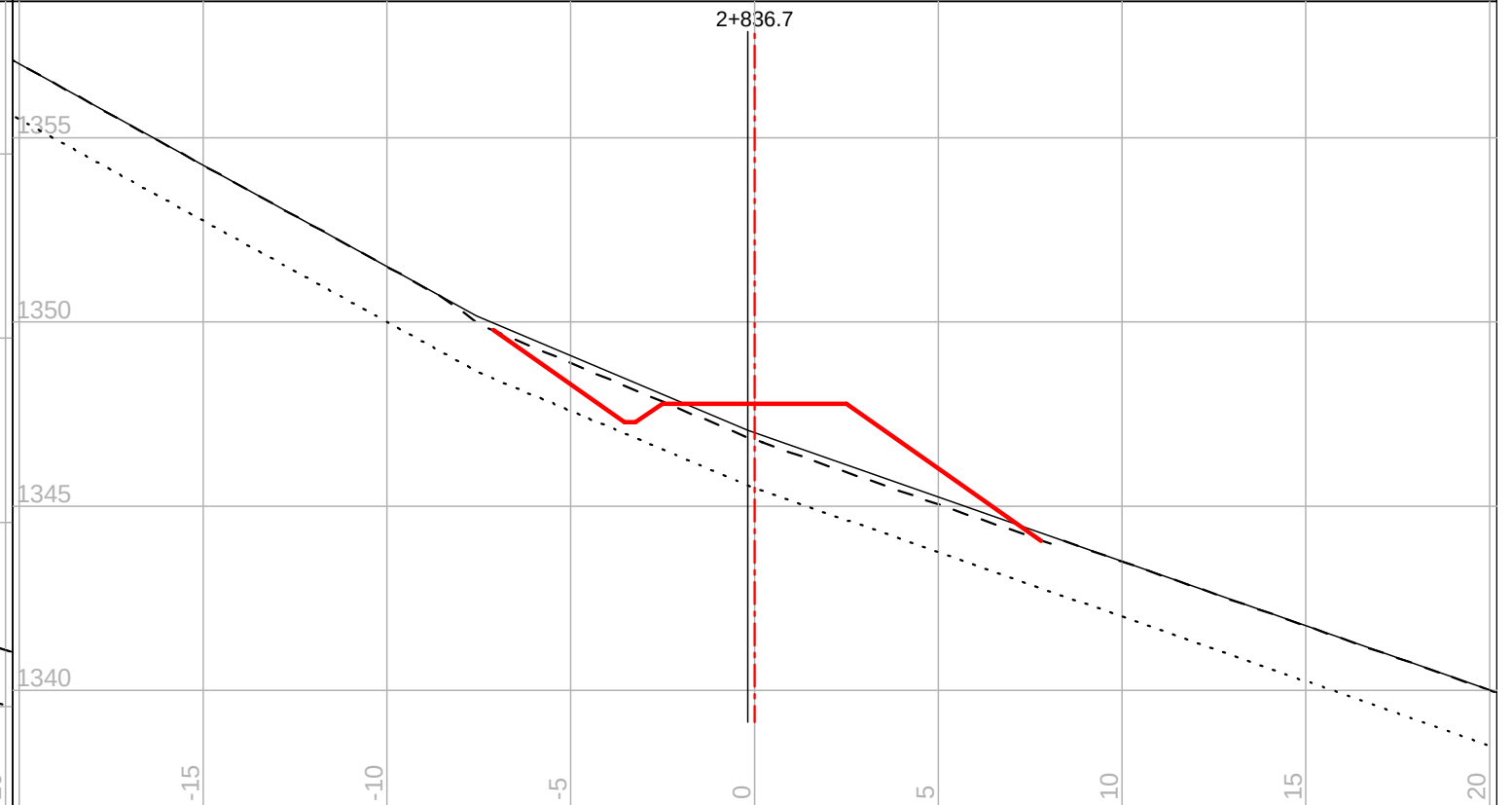
L-Ssl:	30%	H. Offset:	-0.9	Rd. Wd.:	20.5	Stk R:	18.2	CL Elev:	1336.0
L-Ssr:	-30%	Lyr1 Dp.:	1.5	Tmpl:	LND3	Stk L Y:	4.9		
Index:	137	Cut Dp:	-0.4	Stk L:	15.7	Stk R Y:	-6.9		



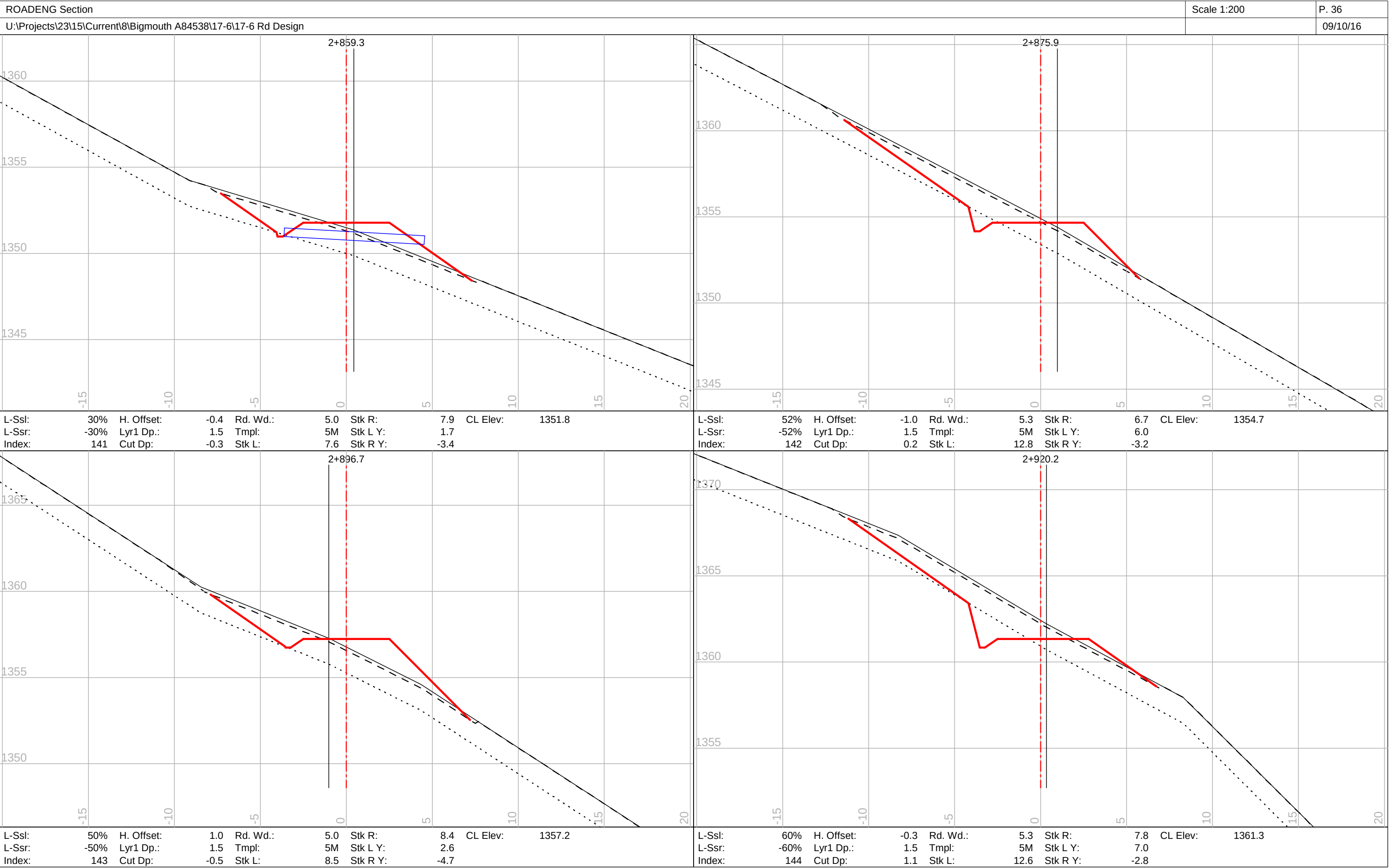
L-Ssl:	-20%	H. Offset:	0.3	Rd. Wd.:	18.4	Stk R:	11.7	CL Elev:	1339.4
L-Ssr:	20%	Lyr1 Dp.:	1.5	Tmpl:	TP	Stk L Y:	7.6		
Index:	138	Cut Dp:	-0.9	Stk L:	17.1	Stk R Y:	-1.7		

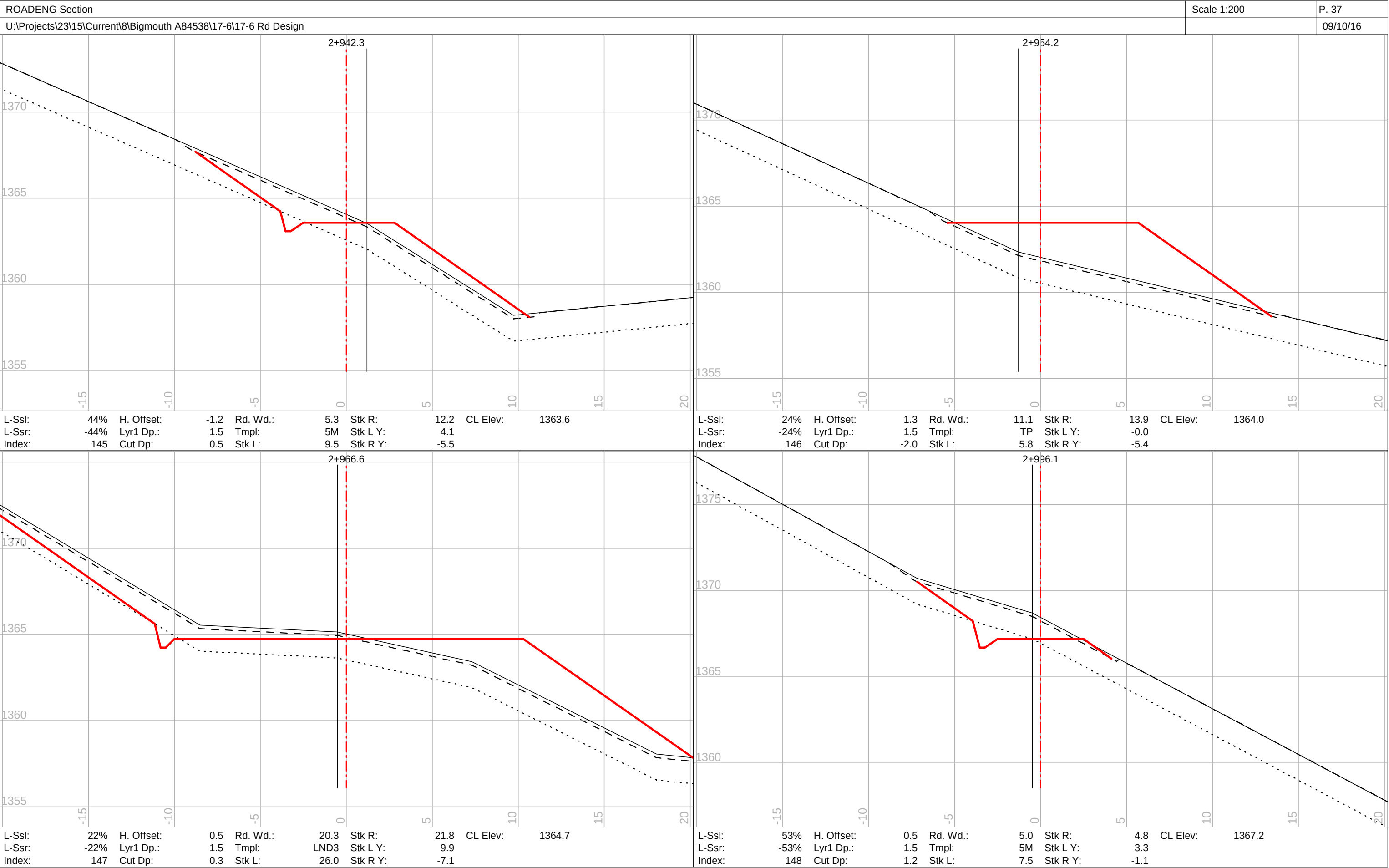


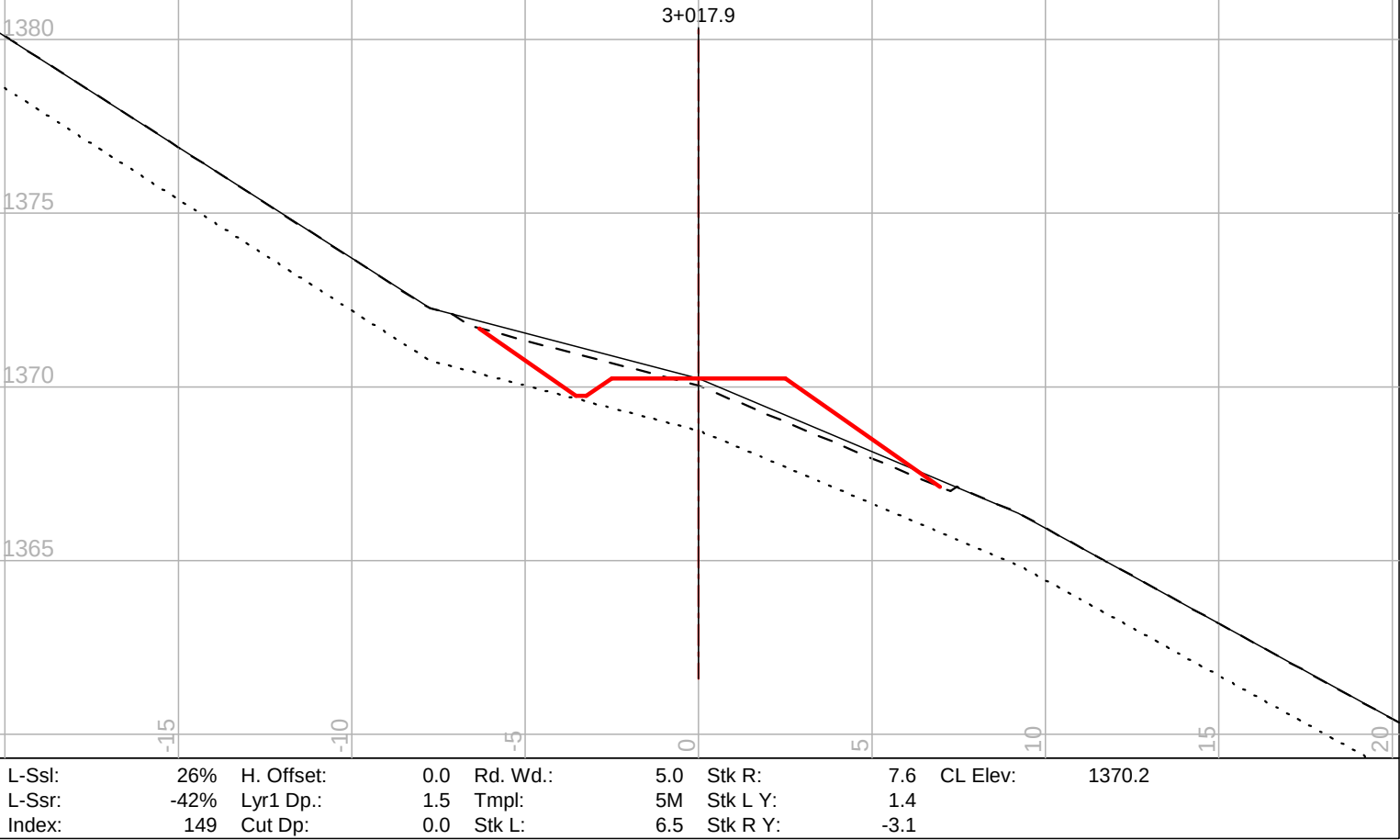
L-Ssl:	56%	H. Offset:	0.5	Rd. Wd.:	5.0	Stk R:	7.9	CL Elev:	1343.2
L-Ssr:	-56%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	3.9		
Index:	139	Cut Dp:	-0.0	Stk L:	9.7	Stk R Y:	-3.3		



L-Ssl:	35%	H. Offset:	0.2	Rd. Wd.:	5.0	Stk R:	8.3	CL Elev:	1347.8
L-Ssr:	-35%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	2.0		
Index:	140	Cut Dp:	-0.8	Stk L:	7.6	Stk R Y:	-3.7		







TRAVERSE NOTES

Description: Branch 17.6 A
 Crew: SE/TL/PW/MJ
 Unit: Blk K671
 Survey Date: Sept 2 /08
 Length: 3014.0m.
 Number of Shots: 174

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	32	10.8	11.0	18.0								
11	254.2						-1.0/..	7.0/..	TI/1.50/HR			403776.7	5745230.0	1025.8
		FS	87	7.8	8.0	23.0								
10	246.4						10.0/15.0 T,30.0/..	4.0/5.0 T,-45.0/..	TI/1.50/HR			403768.8	5745229.6	1024.0
		FS	142	16.2	17.0	32.0								
9:1	230.2:1								TI/1.50/HR		RT 2	403765.0	5745267.9	1018.8
		RS	14	26.3	26.3	0.0								
9	230.2						25.0/4.0 T,50.0/..	-6.0/7.0 T,-45.0/..	TI/1.50/HR		[N]poc SB	403758.6	5745242.4	1018.8
		FS	131	25.7	26.0	15.0								
8	204.5						44.0/..	-3.0/7.0 T,-68.0/10.0 T,-50.0/..	TI/1.50/HR			403738.9	5745259.3	1014.9
		FS	134	29.5	30.0	18.0								
7	175.0						60.0/9.0 T,45.0/..	-14.0/5.0 T,-48.0/..	TI/1.50/HR			403717.3	5745279.9	1009.6
		FS	124	29.6	30.0	16.0								
6	145.3						48.0/7.0 T,42.0/..	-15.0/4.0 T,-56.0/..	TI/1.50/HR			403692.4	5745296.5	1004.9
		FS	128	29.5	30.0	18.0								
5	115.8						27.0/8.0 T,47.0/..	-3.0/5.0 T,-31.0/7.0 T,-50.0/..	TI/1.50/HR			403668.7	5745314.7	999.6
		FS	135	29.4	30.0	20.0								
4	86.4						10.0/3.0 T,53.0/7.0 T,47.0/..	-50.0/9.0 T,-35.0/..	TI/1.50/HR	500	NCD	403647.5	5745335.6	993.7
		FS	135	29.5	30.0	19.0								
3	56.9						3.0/3.0 T,70.0/8.0 T,64.0/..	-14.0/5.0 T,-55.0/7.0 T,2.0/..	TI/1.50/HR			403626.3	5745356.5	988.1
		FS	125	29.5	30.0	19.0								
2	27.5						5.0/1.0 T,65.0/6.0 T,35.0/..	-25.0/8.0 T,4.0/15.0 T,-50.0/..	TI/1.50/HR			403601.8	5745373.5	982.5
		FS	129	27.5	28.0	20.0								
1:1	0.0:1								TI/1.50/HR		RT 1	403590.7	5745403.4	977.0
		RS	40	16.5	16.5	0.0								
1*	0.0						2.0/3.0 T,66.0/..	-5.0/5.0 T,-50.0/7.0 T,-35.0/..	TI/1.50/HR		[N]poc new construction	* 403580.1	5745390.8	* 977.0

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	329	30.0	30.0	5.0								
25	472.1						-48.0/12.0 T,-58.0/..	57.0/..	T2/1.50/HR			403703.9	5745424.3	1047.9
		FS	330	19.9	20.0	8.0								
24	452.2						-37.0/15.0 T,-54.0/..	53.0/..	TI/1.50/HR			403713.8	5745407.0	1046.3
		FS	325	11.0	11.0	-2.0								
23	441.2						-4.0/4.0 T,-48.0/..	38.0/5.0 T,40.0/..	TI/1.50/HR			403720.1	5745397.9	1046.6
		FS	326	14.0	14.0	2.0								
22	427.2						-45.0/..	45.0/..	TI/1.50/HR	500		403727.9	5745386.2	1046.3
		FS	347	15.0	15.0	3.0								
21:1	412.2:1								TI/1.50/HR		RT 3	403734.0	5745394.3	1045.8
		RS	7	23.0	23.0	0.0								
21*	412.2						-70.0/6.0 T,-15.0/6.0 T,-55.0/	47.0/18.0 T,45.0/..	TI/1.50/HR		Jct Branch 17.6D	* 403731.2	5745371.5	1045.8
		FS	0	8.1	9.0	47.0								
20	404.0						-23.0/7.0 T,-63.0/8.0 T,-45.0/	84.0/3.0 T,48.0/..	TI/1.50/HR			403731.1	5745363.4	1042.0
		FS	333	22.8	23.0	12.0								
19	381.2						-5.0/4.0 T,-45.0/..	65.0/12.0 T,50.0/..	TI/1.50/HR	500	[N]start fill	403741.2	5745343.1	1039.3
		FS	335	5.0	5.0	-8.0								
18	376.2						-15.0/5.0 T,-45.0/7.0 T,-50.0/	47.0/..	TI/1.50/HR			403743.2	5745338.6	1039.7
		FS	335	29.8	30.0	12.0								
17	346.4						-28.0/5.0 T,-45.0/..	67.0/8.0 T,53.0/..	TI/1.50/HR			403755.4	5745311.6	1036.1
		FS	321	19.9	20.0	8.0								
16	326.5						-13.0/4.0 T,-60.0/7.0 T,-40.0/	40.0/5.0 T,62.0/8.0 T,45.0/..	TI/1.50/HR			403767.7	5745296.2	1034.5
		FS	340	25.9	26.0	7.0								
15	300.6						-8.0/4.0 T,-50.0/7.0 T,-60.0/..	74.0/7.0 T,60.0/..	TI/1.50/HR			403776.2	5745271.8	1032.7
		FS	335	16.0	16.0	5.0								
14	284.6						-32.0/5.0 T,-37.0/..	80.0/7.0 T,58.0/..	TI/1.50/HR			403782.8	5745257.4	1031.9
		FS	341	10.7	11.0	23.0								
13	273.9						-5.0/5.0 T,-40.0/..	86.0/5.0 T,58.0/..	TI/1.50/HR			403786.1	5745247.3	1029.4
		FS	23	8.8	9.0	19.0								
12	265.0						75.0/8.0 T,40.0/..	-9.0/5.0 T,-38.0/..	TI/1.50/HR		[N] seep - ditch back	403782.6	5745239.2	1027.7

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	110	15.5	16.0	25.0								
38	683.5						15.0/..	7.0/..	TI/1.50/HR			403665.6	5745613.0	1072.5
		FS	68	14.9	15.0	12.0								
37	668.6						-2.0/..	14.0/..	TI/1.50/HR			403651.8	5745607.3	1070.7
		FS	26	14.9	15.0	10.0								
36	653.7						-8.0/12.0 T,-38.0/..	24.0/..	TI/1.50/HR			403645.2	5745593.8	1069.2
		FS	348	7.0	7.0	7.0								
35:1	646.7:1								TI/1.50/HR		RT 5	403668.6	5745585.8	1068.7
		RS	93	22.0	22.0	0.0								
35	646.7						-8.0/8.0 T,-50.0/..	47.0/6.0 T,16.0/..	TI/1.50/HR		POC SB	403646.6	5745587.0	1068.7
		FS	341	16.8	17.0	15.0								
34	629.9						-24.0/8.0 T,-46.0/..	12.0/5.0 T,56.0/..	TI/1.50/HR			403652.0	5745571.0	1066.2
		FS	352	17.8	18.0	15.0								
33	612.1						-22.0/10.0 T,-55.0/..	35.0/..	TI/1.50/HR	500		403654.4	5745553.2	1063.5
		FS	9	11.8	12.0	20.0								
32	600.3						-24.0/8.0 T,-46.0/..	12.0/5.0 T,56.0/..	TI/1.50/HR			403652.6	5745541.6	1061.2
		FS	340	11.9	12.0	12.0								
31:1	588.4:1								TI/1.50/HR		RT 4	403667.7	5745540.3	1059.7
		RS	48	15.0	15.0	0.0								
31	588.4						-22.0/5.0 T,-61.0/..	58.0/5.0 T,37.0/..	TI/1.50/HR			403656.6	5745530.3	1059.7
		FS	327	9.8	10.0	21.0								
30	578.6						-30.0/5.0 T,-58.0/..	46.0/..	T2/1.50/HR			403661.9	5745522.0	1057.7
		FS	340	17.9	18.0	10.0								
29	560.7						-22.0/5.0 T,-60.0/..	72.0/..	T2/1.50/HR			403668.0	5745505.1	1055.9
		FS	345	23.8	24.0	14.0								
28	536.9						-35.0/5.0 T,-64.0/..	68.0/..	T2/1.50/HR			403674.0	5745482.0	1052.6
		FS	342	4.9	5.0	15.0								
27	532.0						-37.0/8.0 T,-64.0/..	59.0/..	T2/1.50/HR			403675.6	5745477.3	1051.8
		FS	334	29.9	30.0	8.0								
26	502.1						-55.0/..	67.0/..	T2/1.50/HR			403688.6	5745450.2	1049.4

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	144	26.6	27.0	18.0								
51	912.4						49.0/..	-33.0/..	TI/1.50/HR	500	[N]NCD	403838.8	5745472.1	1108.9
		FS	130	9.0	9.0	5.0								
50	903.4						45.0/..	-40.0/..	TI/1.50/HR			403831.9	5745477.8	1108.4
		FS	134	5.8	6.0	25.0								
49:1	897.6:1								TI/1.50/HR		RT 7	403839.6	5745489.2	1107.0
		RS	58	14.0	14.0	0.0								
49	897.6						50.0/..	-38.0/..	TI/1.50/HR			403827.7	5745481.8	1107.0
		FS	128	24.7	25.0	15.0								
48	872.9						60.0/15.0 T,48.0/..	-33.0/10.0 T,-45.0/..	TI/1.50/HR			403808.1	5745496.9	1103.2
		FS	140	21.8	22.0	15.0								
47	851.1						45.0/..	-35.0/..	TI/1.50/HR			403794.1	5745513.4	1100.0
		FS	156	17.7	18.0	18.0								
46	833.4						30.0/8.0 T,58.0/..	-8.0/5.0 T,-36.0/..	TI/1.50/HR			403786.8	5745529.5	1096.8
		FS	146	11.7	12.0	22.0								
45	821.7						37.0/5.0 T,61.0/..	-21.0/..	TI/1.50/HR			403780.2	5745539.2	1094.2
		FS	112	8.9	9.0	12.0								
44	812.8						50.0/6.0 T,41.0/..	-20.0/..	TI/1.50/HR			403771.9	5745542.5	1093.1
		FS	111	14.8	15.0	17.0								
43	798.0						38.0/..	-20.0/..	TI/1.50/HR			403758.1	5745547.7	1090.6
		FS	120	27.7	28.0	15.0								
42	770.3						32.0/..	-15.0/..	TI/1.50/HR			403734.0	5745561.4	1086.5
		FS	127	25.7	26.0	16.0								
41	744.6						36.0/..	-12.0/12.0 T,-34.0/..	TI/1.50/HR			403713.4	5745576.7	1082.4
		FS	132	27.8	28.0	12.0								
40:1	716.8:1								TI/1.50/HR		RT 6	403702.5	5745600.1	1079.0
		RS	63	11.0	11.0	0.0								
40	716.8						25.0/10.0 T,50.0/..	-12.0/..	TI/1.50/HR		[N]TOP OF SB	403692.7	5745595.1	1079.0
		FS	136	17.8	18.0	15.0								
39	699.0						12.0/15.0 T,-80.0/..	7.0/..	TI/1.50/HR			403680.2	5745607.8	1076.4

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		RS	78	17.0	17.0	0.0								
65	1208.3						-46.0/..	48.0/..	TI/1.50/HR			404016.8	5745302.4	1157.6
		FS	353	9.0	9.0	7.0								
64	1199.4						-44.0/..	48.0/..	TI/1.50/HR			404017.8	5745293.5	1156.9
		FS	30	15.7	17.0	41.0								
63	1183.6						-3.0/..	-20.0/10.0 T,25.0/..	TI/1.50/HR			404009.9	5745279.8	1150.5
		FS	73	15.7	17.0	42.0								
62	1168.0						18.0/..	-56.0/10.0 T,53.0/5.0 T,-40.0/..	TI/1.50/HR			403994.9	5745275.1	1143.9
		FS	109	15.4	16.0	28.0								
61	1152.6						52.0/..	-54.0/..	TI/1.50/HR			403980.3	5745280.0	1139.6
		FS	153	14.5	15.0	26.0								
60:1	1138.0:1								TI/1.50/HR		RT 8	403997.1	5745301.4	1135.8
		RS	70	25.0	25.0	0.0								
60	1138.0						51.0/..	-46.0/..	TI/1.50/HR		[N]POC SB	403973.6	5745292.9	1135.8
		FS	146	9.8	10.0	-18.0								
59	1128.2						52.0/..	-52.0/..	TI/1.50/HR			403968.1	5745301.0	1137.6
		FS	151	30.0	30.0	2.0								
58	1098.2						62.0/10.0 T,45.0/..	-53.0/..	TI/1.50/HR			403953.5	5745327.0	1137.0
		FS	144	29.9	30.0	10.0								
57	1068.4						62.0/15.0 T,45.0/..	-53.0/..	TI/1.50/HR			403935.8	5745351.0	1134.0
		FS	139	29.7	30.0	14.0								
56	1038.6						55.0/15.0 T,43.0/..	-55.0/..	TI/1.50/HR			403916.2	5745373.2	1129.9
		FS	144	27.7	28.0	14.0								
55	1010.9						57.0/15.0 T,45.0/..	-52.0/..	TI/1.50/HR			403899.9	5745395.5	1126.0
		FS	141	21.6	22.0	20.0								
54	989.3						40.0/5.0 T,55.0/..	-45.0/..	TI/1.50/HR			403886.2	5745412.1	1121.7
		FS	136	29.5	30.0	18.0								
53	959.8						48.0/..	-45.0/..	TI/1.50/HR			403865.6	5745433.2	1116.3
		FS	148	20.8	21.0	13.0								
52	939.0						50.0/..	-45.0/..	TI/1.50/HR			403854.5	5745450.7	1113.6

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	19	24.0	24.0	-3.0								
78:1	1524.8:1								TI/1.50/HR		RT 10	403964.8	5745602.3	1164.0
		RS	113	16.0	16.0	0.0								
78	1524.8						-28.0/7.0 T,-60.0/..	36.0/..	TI/1.50/HR			403950.1	5745608.6	1164.0
		FS	19	19.0	19.0	-2.0								
77	1505.8						-32.0/..	35.0/..	TI/1.50/HR			403943.8	5745590.5	1164.4
		FS	356	23.0	23.0	-6.0								
76	1482.9						-32.0/..	37.0/..	TI/1.50/HR			403945.3	5745567.5	1165.8
		FS	350	22.0	22.0	0.0								
75	1460.9						-30.0/..	40.0/12.0 T,35.0/..	TI/1.50/HR			403949.1	5745545.7	1165.8
		FS	335	22.9	23.0	-8.0								
74	1438.0						-30.0/15.0 T,-42.0/..	38.0/..	TI/1.50/HR			403958.7	5745524.8	1167.6
		FS	347	13.0	13.0	8.0								
73	1425.0						-36.0/..	46.0/..	TI/1.50/HR			403961.6	5745512.1	1166.6
		FS	356	29.9	30.0	8.0								
72	1395.1						-35.0/20.0 T,-45.0/..	43.0/..	TI/1.50/HR			403963.6	5745482.0	1164.2
		FS	349	21.0	21.0	-1.0								
71	1374.1						-42.0/..	45.0/..	TI/1.50/HR			403967.5	5745461.3	1164.4
		FS	345	12.0	12.0	0.0								
70	1362.1						-32.0/..	48.0/..	TI/1.50/HR			403970.6	5745449.6	1164.4
		FS	347	30.0	30.0	0.0								
69	1332.1						-45.0/..	35.0/..	TI/1.50/HR			403977.2	5745420.2	1164.4
		FS	343	29.9	30.0	8.0								
68	1302.2						-35.0/15.0 T,-45.0/..	65.0/5.0 T,45.0/..	TI/1.50/HR			403985.9	5745391.5	1162.0
		FS	343	30.0	30.0	0.0								
67	1272.2						-46.0/..	43.0/..	TI/1.50/HR			403994.6	5745362.6	1162.0
		FS	340	29.9	30.0	8.0								
66	1242.3						-48.0/..	45.0/..	TI/1.50/HR		[N]TOP OF SB	404004.7	5745334.3	1159.6
		FS	339	33.9	34.0	6.0								
65:1	1208.3:1								TI/1.50/HR		RT 9	404033.4	5745306.0	1157.6

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	346	29.9	30.0	8.0								
91:1	1773.3:1								TI/1.50/HR		RT 12	403856.3	5745805.8	1183.5
		RS	70	31.0	31.0	0.0								
91	1773.3						-46.0/..	42.0/..	TI/1.50/HR		LDG 1	403827.1	5745795.2	1183.5
		FS	336	11.9	12.0	10.0								
90	1761.3						-45.0/..	45.0/..	TI/1.50/HR			403832.0	5745784.2	1182.4
		FS	333	23.9	24.0	7.0								
89	1737.4						-50.0/..	46.0/..	TI/1.50/HR		[P]POT DL 1 POC DL 2	403842.8	5745762.8	1180.7
		FS	332	29.7	30.0	14.0								
88	1707.7						-51.0/..	51.0/..	TI/1.50/HR			403856.6	5745736.4	1176.5
		FS	328	29.7	30.0	14.0								
87	1678.0						-50.0/..	56.0/..	TI/1.50/HR			403872.3	5745711.0	1172.4
		FS	323	23.7	24.0	17.0								
86	1654.3						-45.0/..	55.0/..	TI/1.50/HR			403886.4	5745692.0	1168.3
		FS	323	15.9	16.0	10.0								
85	1638.4						-45.0/..	48.0/..	TI/1.50/HR		[N]POC BS TRAIL	403896.0	5745679.1	1166.7
		FS	300	18.0	18.0	0.0								
84:1	1620.4:1								TI/1.50/HR		RT 11	403917.5	5745684.9	1166.7
		RS	22	16.0	16.0	0.0								
84	1620.4						-67.0/..	57.0/8.0 T,40.0/..	T2/1.50/HR		BDY	403911.5	5745670.0	1166.7
		FS	276	13.3	14.0	32.0								
83	1607.0						-62.0/22.0 T,-25.0/..	72.0/..	T2/1.50/HR			403924.7	5745668.6	1162.5
		FS	287	14.0	14.0	6.0								
82	1593.1						-65.0/20.0 T,-20.0/..	60.0/..	T2/1.50/HR			403938.0	5745664.4	1161.6
		FS	298	17.3	19.0	46.0								
81	1575.8						-15.0/10.0 T,-30.0/..	32.0/..	T2/1.50/HR	1400	S6	403953.2	5745656.2	1153.7
		FS	327	13.2	15.0	-54.0								
80	1562.6						-94.0/10.0 T,-18.0/15.0 T,20.0/..	88.0/..	T2/1.50/HR			403960.4	5745645.0	1160.8
		FS	10	13.8	14.0	-18.0								
79	1548.8						-68.0/..	62.0/..	T2/1.50/HR		[N]POC FULL BENCH E/H	403957.9	5745631.4	1163.3

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		RS	140	29.0	29.0	-2.0								
104	2047.2						47.0/..	-38.0/..	TI/1.50/HR			403931.4	5745808.3	1223.4
		FS	107	23.6	24.0	18.0								
103	2023.6						42.0/..	-40.0/..	TI/1.50/HR	500	[N]NCD - DL 2 STA 6	403908.7	5745815.0	1219.1
		FS	122	29.5	30.0	18.0								
102	1994.1						40.0/..	-40.0/..	TI/1.50/HR			403883.6	5745830.5	1213.8
		FS	140	29.9	30.0	8.0								
101	1964.2						47.0/..	-38.0/..	TI/1.50/HR			403864.3	5745853.2	1211.4
		FS	158	24.0	24.0	3.0								
100:1	1940.2:1								TI/1.50/HR		RT 14	403875.2	5745873.9	1210.7
		RS	94	20.0	20.0	0.0								
100	1940.2						45.0/..	-43.0/..	TI/1.50/HR		[N]TOP OF SB = SPLITLIN	403855.2	5745875.3	1210.7
		FS	165	25.6	26.0	18.0								
99	1914.6						40.0/..	-40.0/..	TI/1.50/HR			403848.5	5745899.9	1206.1
		FS	128	11.7	13.0	48.0								
98	1902.9						-2.0/..	0.0/..	TI/1.50/HR			403839.3	5745907.0	1200.5
		FS	96	8.9	10.0	50.0								
97	1894.0						-3.0/..	14.0/..	TI/1.50/HR			403830.3	5745907.9	1196.0
		FS	62	9.3	10.0	38.0								
96:1	1884.6:1								TI/1.50/HR		RT 13	403835.1	5745892.6	1192.5
		RS	130	17.0	17.0	0.0								
96	1884.6						-27.0/12.0 T,-60.0/..	36.0/..	TI/1.50/HR		JCT BR 17.6E	403822.0	5745903.5	1192.5
		FS	30	17.5	18.0	23.0								
95	1867.1						-55.0/..	50.0/..	TI/1.50/HR			403813.2	5745888.2	1188.4
		FS	357	18.0	18.0	5.0								
94	1849.1						-48.0/15.0 T,-60.0/..	58.0/..	TI/1.50/HR			403814.1	5745870.1	1187.5
		FS	350	30.0	30.0	0.0								
93	1819.1						-47.0/..	35.0/8.0 T,52.0/..	TI/1.50/HR		[N]POC SB	403819.2	5745840.4	1187.5
		FS	357	15.9	16.0	10.0								
92	1803.2						-47.0/..	42.0/..	TI/1.50/HR			403820.0	5745824.4	1185.9

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		RS	158	21.8	21.8	0.0								
116	2338.8						0.0/..	0.0/8.0 T,50.0/..	TI/1.50/HR			404207.3	5745737.9	1271.8
		FS	74	14.9	17.0	55.0								
115	2323.9						40.0/..	40.0/7.0 T,-16.0/5.0 T,-84.0/..	T2/1.50/HR			404193.0	5745733.7	1263.6
		FS	117	13.8	14.0	16.0								
114:1	2310.1:1								TI/1.50/HR		RT 16	404190.6	5745757.2	1261.4
		RS	30	20.0	20.0	0.0								
114	2310.1						58.0/..	-38.0/20.0 T,-60.0/..	T2/1.50/HR		[N]POC SB	404180.6	5745739.9	1261.4
		FS	117	21.0	21.0	-2.0								
113	2289.1						52.0/..	-50.0/..	T2/1.50/HR			404161.8	5745749.3	1261.8
		FS	124	21.9	22.0	10.0								
112	2267.2						62.0/..	-47.0/..	T2/1.50/HR			404143.6	5745761.4	1259.6
		FS	124	29.7	30.0	14.0								
111	2237.5						78.0/..	-57.0/15.0 T,-35.0/..	T2/1.50/HR			404118.9	5745777.9	1255.5
		FS	106	29.8	30.0	11.0								
110	2207.6						37.0/10.0 T,80.0/..	-45.0/10.0 T,-55.0/..	T2/1.50/HR	500	NCD	404090.1	5745785.9	1252.2
		FS	99	20.5	21.0	22.0								
109	2187.1						50.0/16.0 T,60.0/..	-55.0/10.0 T,-45.0/..	TI/1.50/HR			404069.8	5745789.0	1247.7
		FS	94	29.6	30.0	16.0								
108:1	2157.5:1								TI/1.50/HR		RT 15	404046.5	5745806.7	1242.9
		RS	22	17.0	17.0	0.0								
108	2157.5						50.0/..	-60.0/20.0 T,-20.0/..	TI/1.50/HR			404040.2	5745790.9	1242.9
		FS	98	24.5	25.0	20.0								
107	2133.0						40.0/2.0 T,55.0/..	-50.0/..	TI/1.50/HR		NCD	404015.8	5745794.2	1238.0
		FS	93	29.5	30.0	18.0								
106	2103.5						48.0/..	-34.0/..	TI/1.50/HR			403986.2	5745795.5	1232.7
		FS	105	26.7	27.0	15.0								
105	2076.8						40.0/..	-38.0/..	TI/1.50/HR			403960.4	5745802.3	1228.7
		FS	102	29.5	30.0	18.0								
104:1	2047.2:1								TI/1.50/HR		LDG 2	403950.0	5745786.0	1222.8

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		RS	76	26.0	26.0	0.0								
129	2614.7						-30.0/8.0 T,-42.0/..	40.0/..	TI/1.50/HR		[N]POC SB	404055.3	5745955.2	1316.3
		FS	349	15.9	16.0	8.0								
128	2598.8						-45.0/7.0 T,-65.0/..	40.0/..	T2/1.50/HR		[P]POT DL 2	404058.3	5745939.3	1315.1
		FS	330	13.0	13.0	8.0								
127	2585.8						-66.0/..	44.0/..	T2/1.50/HR			404064.7	5745927.9	1314.0
		FS	334	29.5	30.0	19.0								
126	2556.4						-64.0/..	60.0/10.0 T,52.0/..	T2/1.50/HR			404077.5	5745901.0	1308.4
		FS	320	17.9	18.0	10.0								
125	2538.4						-64.0/..	60.0/..	T2/1.50/HR			404089.0	5745887.0	1306.6
		FS	322	29.4	30.0	20.0								
124	2509.0						-64.0/..	64.0/..	T2/1.50/HR			404107.0	5745863.4	1300.7
		FS	315	29.6	30.0	16.0								
123	2479.4						-60.0/8.0 T,-75.0/..	55.0/15.0 T,65.0/..	T2/1.50/HR			404127.8	5745842.1	1296.0
		FS	316	18.6	19.0	22.0								
122	2460.8						-60.0/12.0 T,-75.0/..	71.0/..	T2/1.50/HR			404140.6	5745828.5	1291.9
		FS	318	29.4	30.0	20.0								
121	2431.4						-50.0/8.0 T,-70.0/..	84.0/..	T2/0.50/HR			404160.2	5745806.2	1286.0
		FS	311	22.6	23.0	18.0								
120	2408.8						-60.0/..	65.0/8.0 T,80.0/..	T2/0.50/HR			404177.2	5745791.1	1282.0
		FS	302	20.7	21.0	18.0								
119	2388.1						-32.0/15.0 T,-60.0/..	74.0/..	T2/0.50/HR			404194.7	5745779.8	1278.2
		FS	312	17.9	18.0	-12.0								
118:1	2370.3:1								TI/1.50/HR		RT 17	404225.0	5745776.0	1280.4
		RS	64	19.0	19.0	0.0								
118	2370.3						-36.0/15.0 T,-60.0/..	50.0/7.0 T,63.0/..	T2/1.50/HR		[N]TOP OF SB	404207.9	5745767.6	1280.4
		FS	341	16.9	17.0	12.0								
117	2353.4						-53.0/..	60.0/7.0 T,45.0/..	TI/1.50/HR			404213.3	5745751.4	1278.4
		FS	24	14.6	16.0	45.0								
116:1	2338.8:1								TI/1.50/HR		[N]FC 5	404215.5	5745717.7	1271.8

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	107	22.6	23.0	19.0								
140	2832.0						42.0/8.0 T,55.0/..	-35.0/..	TI/1.50/HR			404207.1	5745908.5	1347.1
		FS	106	29.8	30.0	12.0								
139:1	2802.2:1								TI/1.50/HR		RT 21	404189.3	5745929.4	1343.5
		RS	40	17.0	17.0	0.0								
139	2802.2						45.0/..	-56.0/5.0 T,-28.0/..	TI/1.50/HR		LDG 3	404178.4	5745916.3	1343.5
		FS	105	25.5	26.0	20.0								
138	2776.7						55.0/7.0 T,65.0/..	20.0/7.0 T,-38.0/12.0 T,-50.0/..	T2/1.50/HR			404153.6	5745922.6	1338.4
		FS	110	29.9	30.0	10.0								
137	2746.9						30.0/12.0 T,55.0/..	-26.0/6.0 T,-45.0/..	T2/1.50/HR		[P]7M AHEAD POC DL 14	404125.5	5745932.4	1335.4
		FS	129	14.0	14.0	6.0								
136	2732.9						38.0/..	-20.0/5.0 T,-38.0/15.0 T,-60.0/..	T2/1.50/HR			404114.6	5745941.0	1334.6
		FS	142	18.0	18.0	2.0								
135:1	2714.9:1								T2/1.50/HR		RT 20	404123.5	5745963.9	1334.2
		RS	66	22.0	22.0	0.0								
135	2714.9						44.0/..	-38.0/..	TI/1.50/HR		[N]TOP OF SB	404103.4	5745954.9	1334.2
		FS	175	19.0	19.0	0.0								
134	2695.9						38.0/..	-34.0/..	TI/1.50/HR			404101.7	5745973.6	1334.2
		FS	152	15.9	17.0	37.0								
133	2680.0						28.0/..	0.0/..	TI/1.50/HR			404094.1	5745987.5	1328.3
		FS	118	15.4	16.0	28.0								
132	2664.6						-30.0/..	22.0/..	TI/1.50/HR			404080.5	5745994.5	1324.0
		FS	66	13.9	15.0	40.0								
131:1	2650.6:1								TI/1.50/HR		RT 19	404078.7	5745964.0	1318.4
		RS	156	27.0	27.0	0.0								
131	2650.6						-50.0/15.0 T,-65.0/..	40.0/15.0 T,20.0/..	TI/1.50/HR		JCT BR 17.6F	404067.7	5745988.6	1318.4
		FS	30	20.9	21.0	10.0								
130	2629.7						-41.0/12.0 T,-65.0/..	44.0/10.0 T,31.0/..	TI/1.50/HR			404057.2	5745970.2	1316.3
		FS	7	15.0	15.0	0.0								
129:1	2614.7:1								TI/1.50/HR		RT 18	404080.5	5745961.4	1316.3

Index	Station	Type	Fore	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	102			0.0								
149:1	3014.0:1								TI/1.50/HR		RT 23	404404.1	5745835.8	1370.2
		RS	102	36.0	36.0	0.0								
149	3014.0						26.0/8.0 T,64.0/..	-42.0/10.0 T,-55.0/..	TI/1.50/HR		[P]POT = POC DL 17	404368.9	5745843.3	1370.2
		FS	136	21.9	22.0	7.0								
148	2992.0						30.0/7.0 T,55.0/..	-53.0/..	TI/1.50/HR			404353.6	5745858.8	1368.7
		FS	134	29.8	30.0	12.0								
147:1	2962.2:1								TI/1.50/HR		RT 22	404349.4	5745886.8	1365.1
		RS	66	19.0	19.0	0.0								
147	2962.2						5.0/8.0 T,60.0/..	-22.0/8.0 T,-50.0/12.0 T,-10.0/..	TI/1.50/HR		LDG 5 = SPLITLINE	404332.0	5745879.1	1365.1
		FS	128	12.7	13.0	22.0								
146	2949.5						46.0/..	-24.0/..	TI/1.50/HR			404322.0	5745886.7	1362.3
		FS	104	11.9	12.0	-10.0								
145	2937.6						44.0/..	-63.0/10.0 T,10.0/..	TI/1.50/HR		[P]POC DL 16	404310.3	5745889.4	1363.5
		FS	106	22.0	22.0	6.0								
144	2915.6						60.0/10.0 T,40.0/..	-54.0/9.0 T,-100.0/..	TI/1.50/HR			404289.2	5745895.2	1362.2
		FS	98	23.5	24.0	21.0								
143	2892.1						40.0/8.0 T,65.0/..	-50.0/6.0 T,-65.0/..	TI/1.50/HR			404265.8	5745898.1	1357.3
		FS	90	20.8	21.0	14.0								
142	2871.3						52.0/..	-58.0/..	TI/1.50/HR		[P]6M BACK POC DL 15 =	404244.9	5745897.8	1354.4
		FS	106	16.7	17.0	18.0								
141	2854.6						30.0/10.0 T,55.0/..	-40.0/..	TI/1.50/HR			404228.8	5745902.2	1351.4

CULVERT SUMMARY

Culvert Summary

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
	0+018.1	500	10	120
4	0+087.3	500	9	100
6	0+147.0	500	9	120
	0+225.0	500	10	110
15	0+301.8	500	9	70
19	0+381.5	500	10	90
22	0+426.7	500	11	80
27	0+531.8	500	9	70
33	0+612.0	500	9	75
42	0+769.8	500	10	120
47	0+850.0	500	9	110
51	0+910.9	500	10	90
55	1+009.2	500	9	110
	1+116.0	500	9	110
66	1+237.6	500	9	75
72	1+391.2	500	9	90
81	1+572.9	1400	20	90
87	1+675.0	500	9	70
	1+827.8	500	9	70
101	1+963.3	500	11	100
103	2+022.7	500	9	90
107	2+132.2	500	9	90
110	2+206.9	500	8	90
113	2+288.3	500	9	110
120	2+413.0	500	9	70
124	2+513.7	500	9	70
128	2+603.8	500	8	80
135	2+719.8	500	11	100
141	2+859.3	500	9	115

Totals

# of Culverts	Dia (mm)	Length (m)
28	500	261
1	1400	20

APPENDIX 2

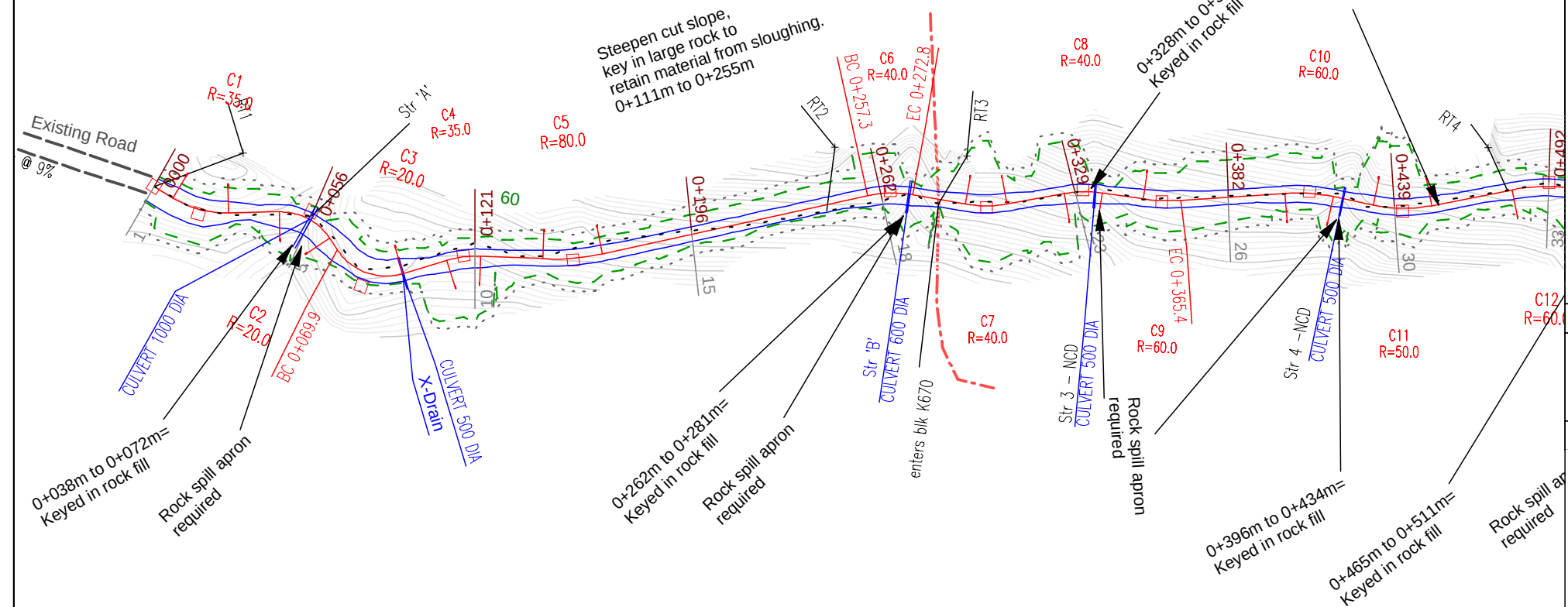
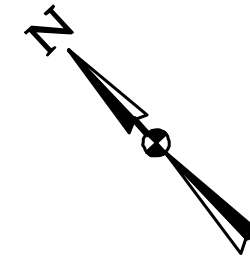
Branch 17.6A

Level 2 Geometric Road Design

Bigmouth 17.6A Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+000.0	1	TI	HR		0.0	58	61	0
0+014.3	2	TI	HR		0.5	112	69	6
0+027.9	3	TI	HR		1.0	138	155	61
0+048.5	4	TI	HR		-0.1	2	251	12
0+055.8	5	TI	HR		-3.8	11	253	-300
0+063.4	6	TI	HR		-0.1	219	66	-605
0+080.3	7	TI	HR		2.4	238	0	-455
0+095.5	8	TI	HR		1.0	52	104	-201
0+102.8	9	TI	HR		-0.5	56	820	-252
0+120.9	10	T2	HR		-0.6	95	306	-1016
0+136.2	11	T2	HR		1.5	106	6	-1224
0+145.4	12	T2	HR		1.6	118	51	-1115
0+159.7	13	T2	HR		0.5	67	29	-1041
0+169.6	14	T2	HR		0.8	198	26	-1001
0+195.9	15	T2	HR		1.4	158	4	-820
0+212.3	16	T2	HR		1.4	396	1	-658
0+242.6	17	T2	HR		2.4	342	1	-230
0+261.9	18	TI	HR		2.3	80	166	141
0+271.6	19	TI	HR		-4.0	45	183	17
0+282.0	20	TI	HR		1.9	205	62	-167
0+295.2	21	TI	HR		-0.1	129	285	-16
0+309.4	22	TI	HR		-0.6	204	280	-172
0+329.0	23	TI	HR		1.2	51	75	-245
0+335.9	24	TI	HR		-2.1	33	192	-286
0+351.2	25	TI	HR		0.3	209	212	-488
0+381.6	26	TI	HR		0.1	287	92	-490
0+412.1	27	TI	HR		1.1	35	181	-297
0+421.0	28	TI	HR		-3.9	43	152	-487
0+429.1	29	TI	HR		1.1	196	24	-635
0+438.9	30	TI	HR		1.0	234	74	-458
0+460.3	31	T2	HR		0.2	130	29	-293
0+478.2	32	T2	HR		1.5	72	92	-191
0+492.3	33	T2	HR		-1.2	0	219	-231
0+500.0	34	T2	HR		-3.4	1	225	-505
0+508.1	35	T2	HR		-1.1	125	79	-786
0+514.4	36	TI	HR		1.1	793	280	-739
0+543.4	37	TI	HR		1.1	87	244	-177
0+560.2	38	T2	HR		-2.0	83	224	-332
0+578.4	39	T2	HR		1.4	223	102	-471
0+608.8	40	TI	HR		0.0	240	131	-345
0+638.9	41	TI	HR		1.5	140	111	-232
0+661.3	42	T2	HR		-0.9	3	130	-227
0+666.8	43	T2	HR		-2.6	162	313	-387
0+695.6	44	T2	HR		2.2	90	0	-582
0+699.5	45	T2	HR		3.1	186	115	-474
0+727.3	46	TI	HR		-1.3	49	118	-397
0+746.2	47	TI	HR		1.3	181	12	-475
0+769.2	48	TI	HR		1.7	258	10	-272

Bigmouth 17.6A Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+794.4	49	T2	HR		1.3	53	95	4
0+803.2	50	T2	HR		-0.9	19	123	-59
0+811.4	51	T2	HR		0.1	6	207	-193
0+819.4	52	T2	HR		-3.2	0	158	-447
0+823.6	53	T2	HR		-2.7	2	275	-644
0+833.3	54	T2	HR		-1.9	103	104	-986
0+847.0	55	T2	HR		2.9	137	0	-1001
0+856.5	56	T2	HR		1.6	103	9	-845
0+867.8	57	T2	HR		1.2	130	6	-739
0+877.7	58	T2	HR		3.0	171	0	-595
0+886.1	59	T2	HR		3.1	252	0	-397
0+897.4	60	T2	HR		2.5	414	0	-103
0+919.7	61	TI	HR		2.2	157	0	373
0+928.9	62	TI	HR		1.5	132	17	552
0+948.5	63	T2	HR		0.4	104	212	670
0+963.2	64	TI	HR		-0.2	300	722	516
0+992.1	65	TI	HR		1.1	73	105	-50
1+009.6	66	TI	HR		-0.1	44	98	-77
1+027.2	67	T2	HR		0.5	106	41	-124
1+051.7	68	T2	HR		0.7	141	13	-47
1+074.0	69	T2	HR		1.5	55	75	105
1+089.5	70	T2	HR		-0.9	16	57	75
1+097.2	71	T2	HR		0.4	58	40	23
1+111.8	72	T2	HR		0.2	45	29	40
1+123.5	3	T2	HR		0.6	91	14	57
1+138.0	73	T2	HR		1.5	56	72	148
1+155.7	74	T2	HR		-1.1	16	28	123
1+161.1	75	T2	HR		1.3	47	41	106
1+167.9	3	T2	HR		1.0	18	195	111
1+176.1	76	T2	HR		-2.8	46	199	-112
1+188.1	77	T2	HR		2.3	220	6	-305
1+207.7	78	T2	HR		1.5	153	24	-47
1+223.6	79	T2	HR		0.7	108	73	107
1+240.4	80	T2	HR		0.1	84	36	143
1+255.9	81	T2	HR		1.4	62	57	198
1+270.5	82	T2	HR		-0.6			200

PLAN AND PROFILE SHEETS



Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

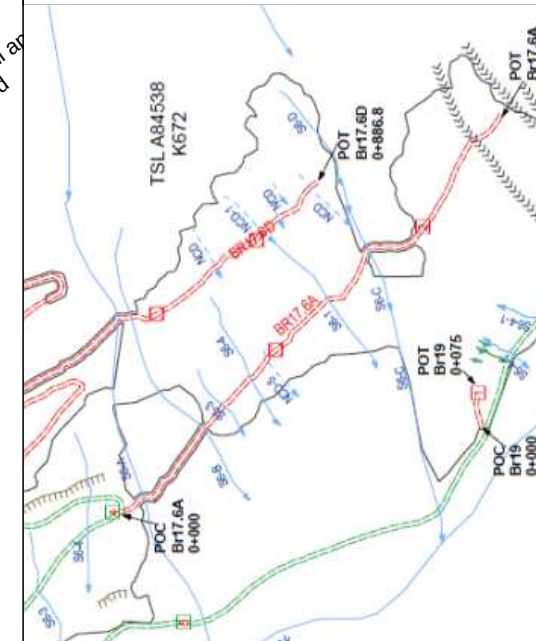
Legend

-  L-Line Location
-  P-line Location
-  Road Edges
-  Slope Stake Elevation
-  Clearing Limits
-  Culverts
-  RT
-  2m Contours
-  Proposed Road

Plan Scale 1:2000



Key Map



TSL A84538
Bigmouth
Proposed Branch 17.6A
UBI - 40BK672

Level 2 Road Survey
1 - 0+000 to 82 - 1+271

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

Culvert Summary

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
5	0+055.8	1000	16.0	90
8	0+095.5	500	11.0	90
19	0+271.6	600	11.0	90
24	0+335.9	500	9.0	90
28	0+421.0	500	10.0	90

Reference Point Summary

	Index	P-Stn	L-Stn	RS1 Az deg.	RS1 HD m.	RS1 Cmt
E171.8A 1427E	1	0+000.0	0+000.0	113.0	32.4	RT1
	17	0+239.9	0+242.6	51.0	22.0	RT2
	20	0+278.5	0+282.0	74.0	19.0	RT3
	32	0+472.6	0+478.2	19.0	16.0	RT4

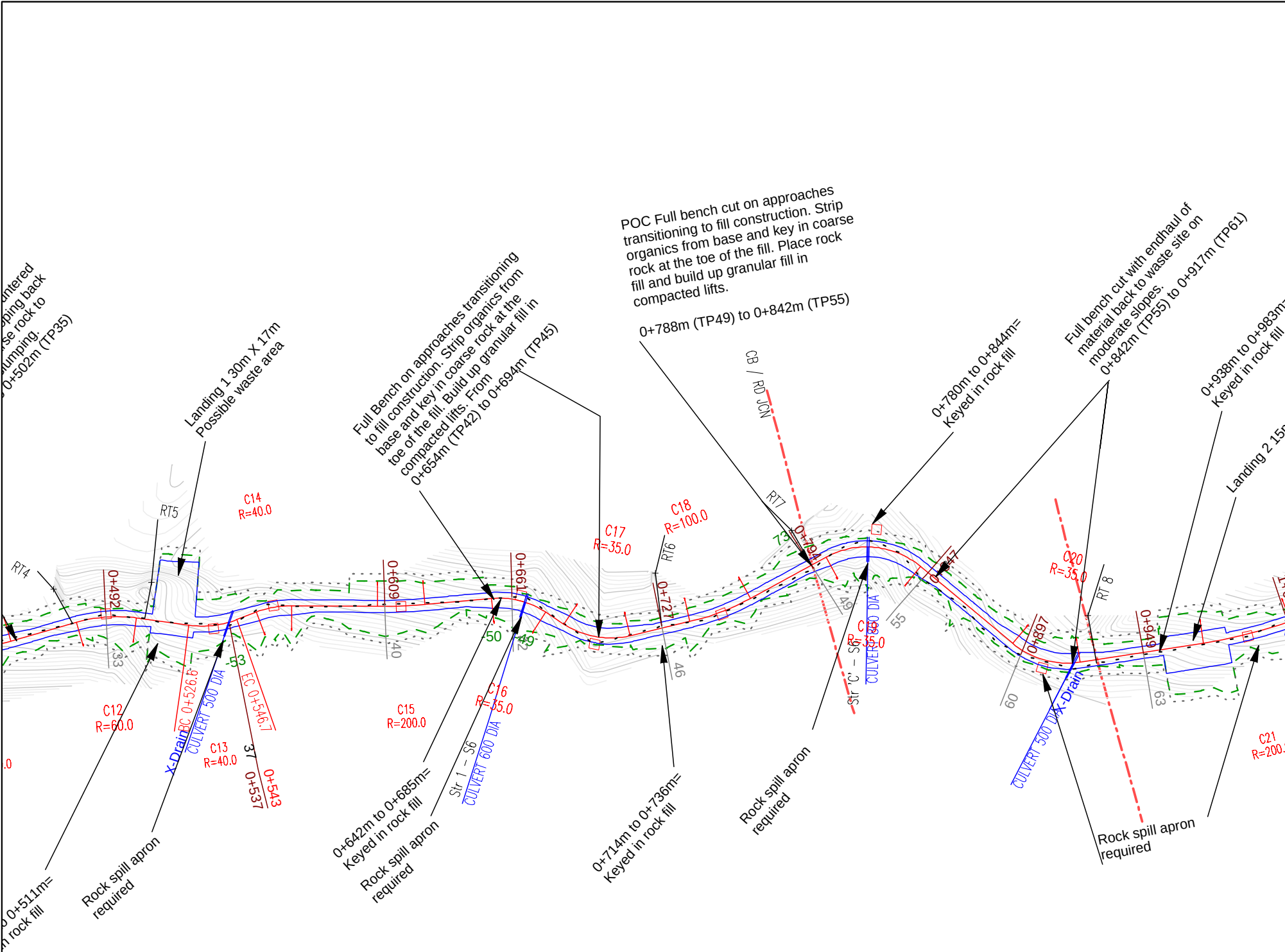
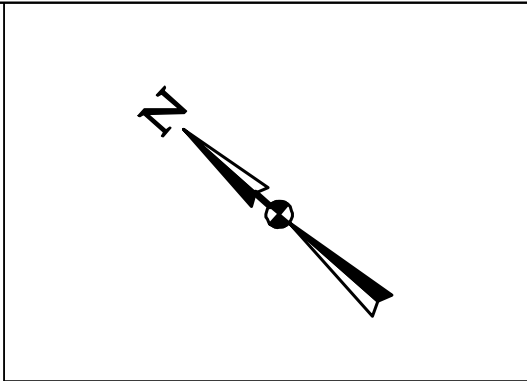
Page 1 of 3

Design Date	09/04/09	Design By:	Ed Folk, RFT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

S:\23\15\Current\8\Bigmouth A84538\17-6A\Branch 17-6A.dsn

Prepared By:
Forsite Engineering & Geoscience Ltd.
PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366

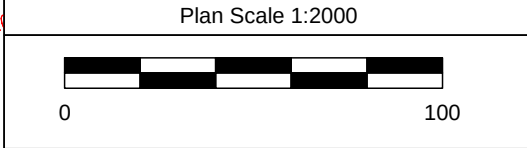
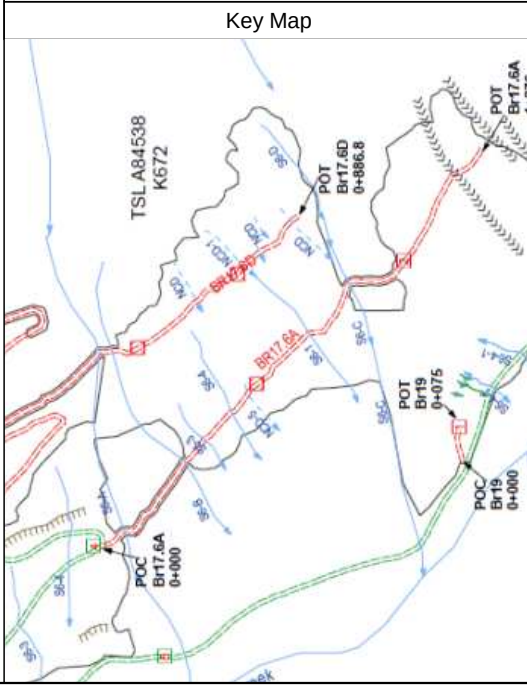




Magnetic declination 19 ° 58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

Legend	
	L-Line Location
	P-line Location
	Road Edges
	Slope Stake Elevation
	Clearing Limits
	Culverts
	RT
	2m Contours
	Proposed Road





BCTS
BC Timber Sales
Okanagan - Columbia

TSL A84538
Bigmouth
Proposed Branch 17.6A
UBI - 40BK672

Level 2 Road Survey
1 - 0+000 to 82 - 1+271

Design Template Key	
Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

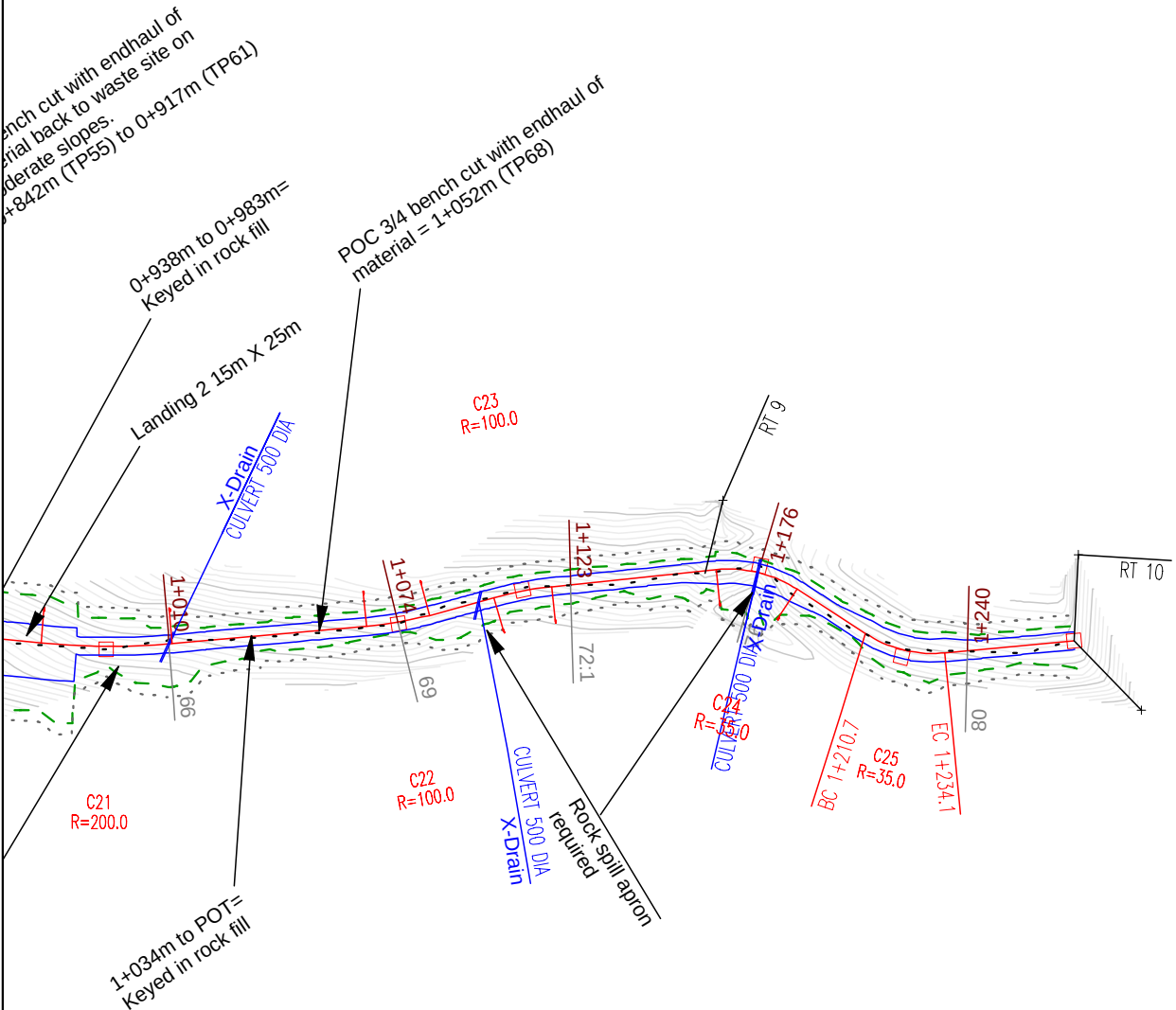
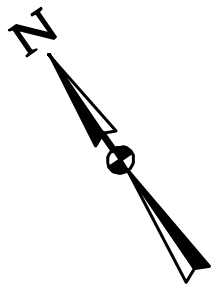
Culvert Summary				
Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
37	0+543.4	500	11.0	125
43	0+666.8	600	10.0	90
52	0+819.4	800	10.0	90
61	0+919.7	500	12.0	122

Reference Point Summary					
Index	P-Stn m.	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
32	0+472.6	0+478.2	19.0	16.0	RT4
35	0+502.5	0+508.1	60.0	15.0	RT5
46	0+722.2	0+727.3	42.0	22.0	RT6
49	0+788.1	0+794.4	19.0	18.0	RT7
62	0+927.3	0+928.9	38.0	20.0	RT 8

Page 2 of 3			
Design Date	09/04/09	Design By:	Ed Folk, RFT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng
S:\23\15\Current\8\Bigmouth A84538\17-6A\Branch 17-6A.dsn			

Prepared By:
Forsite Engineering & Geoscience Ltd.
PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366





TSL A84538
 Bigmouth
 Proposed Branch 17.6A
 UBI - 40BK672

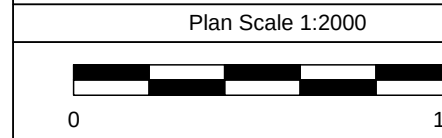
Level 2 Road Survey
 1 - 0+000 to 82 - 1+271

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

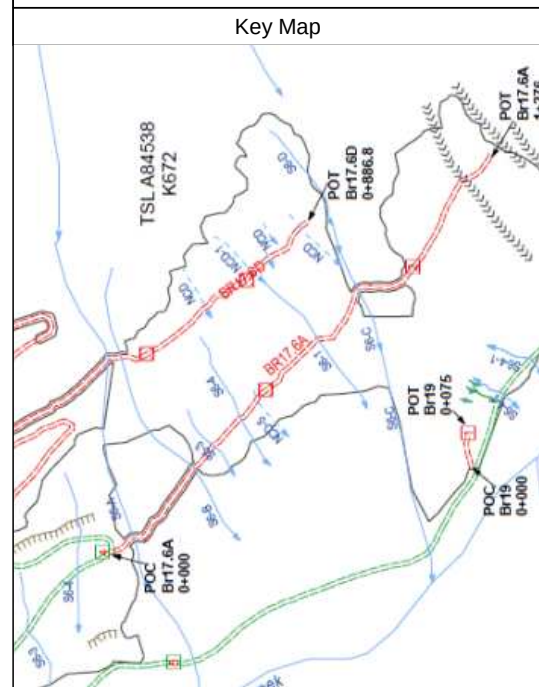
NOTE:
 The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

- Legend
- L-Line Location
 - P-line Location
 - Road Edges
 - Slope Stake Elevation
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 - Proposed Road



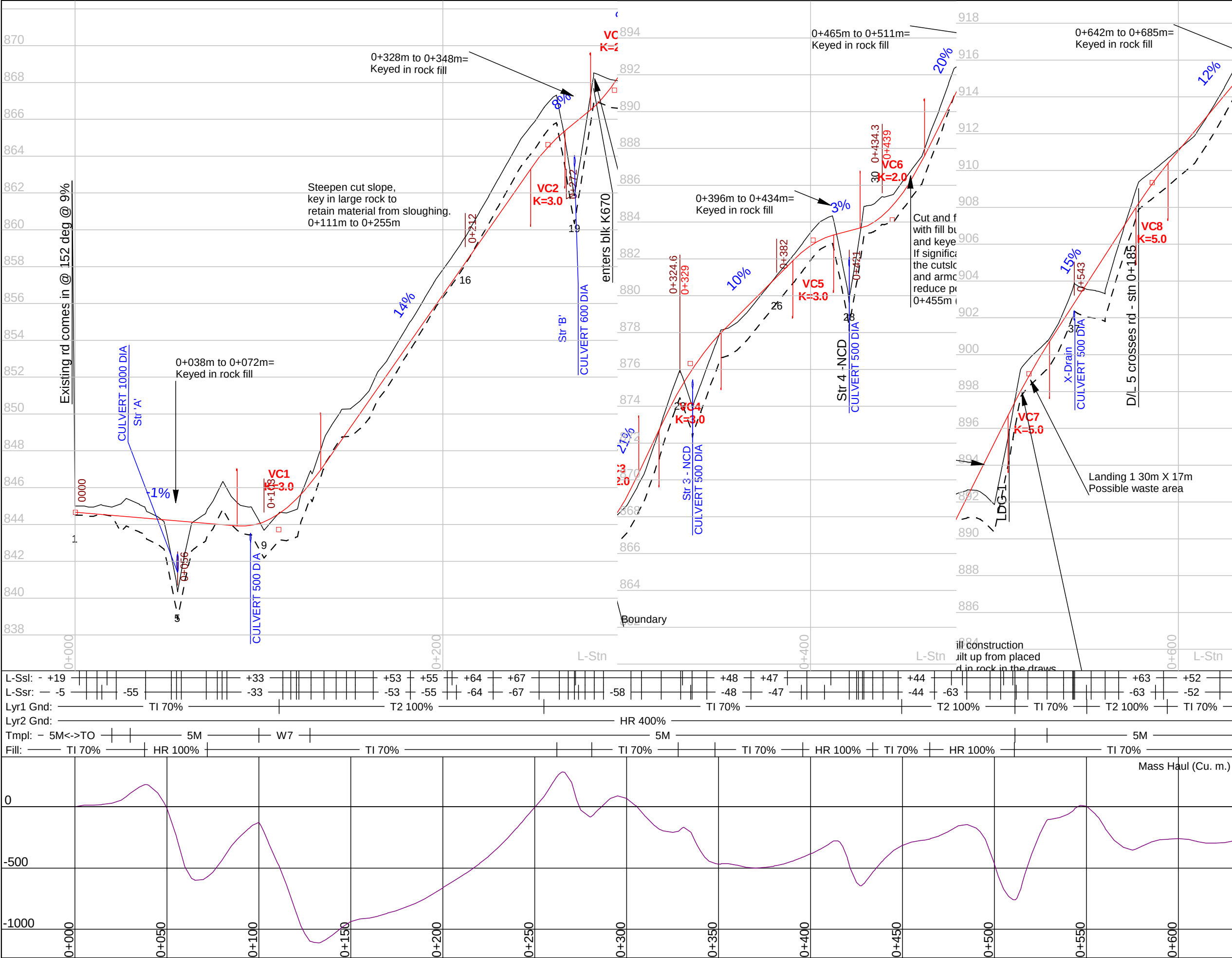
Culvert Summary				
Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
66	1+009.6	500	9.0	120
71	1+097.2	500	8.0	118
76	1+176.1	500	10.0	90

Reference Point Summary					
Index	P-Stn m.	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
75	1+164.0	1+161.1	48.0	21.0	RT 9
82	1+276.1	1+270.5	37.0	24.0	RT 10



Page 3 of 3			
Design Date	09/04/09	Design By:	Ed Folk, RFT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

S:\23\15\Current\8\Bigmouth A84538\17-6A\Branch 17-6A.dsn
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BCTS

BC Timber Sales

Okanagan - Columbia

TSL A84538
Bigmouth
Proposed Branch 17.6A
UBI - 40BK672

Level 2 Road Survey
1 - 0+000 to 82 - 1+271

Design Template Key	
Template ID	Description
5M	5 meter road
TO	Turnout template
TP	Taper template
W	Waste template
LDG	Landing template

Soils			
Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width
T1 Till	70%	70%	0.5m X 0.3m
T2 Till - steep cut	100%	70%	0.5m X 0.3m
HR Hard Rock	400%	100%	0.5m X 0.3m

Earthworks Summary				
L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+000.0	895.3	1025.9	325.7	0.0
0+100.0	680.8	1212.6	321.7	-130.6
0+200.0	1318.9	591.3	334.0	-662.4
0+300.0	676.9	1126.3	487.9	65.3
0+400.0	852.1	933.5	388.7	-384.2
0+500.0	1315.7	1110.6	434.9	-465.5
0+600.0	720.4	941.1	332.2	-260.4
0+700.0				
Pg. Tot.	6460.2	6941.2	2625.1	
Cum. Tot.	6460.2	6941.2	2625.1	

Legend

Ground Topography

Profile Subgrade

Culverts

Gnd layer 1

Index Station

Vertical Scale 1:200
Horizontal Scale 1:2000

Page 1 of 3

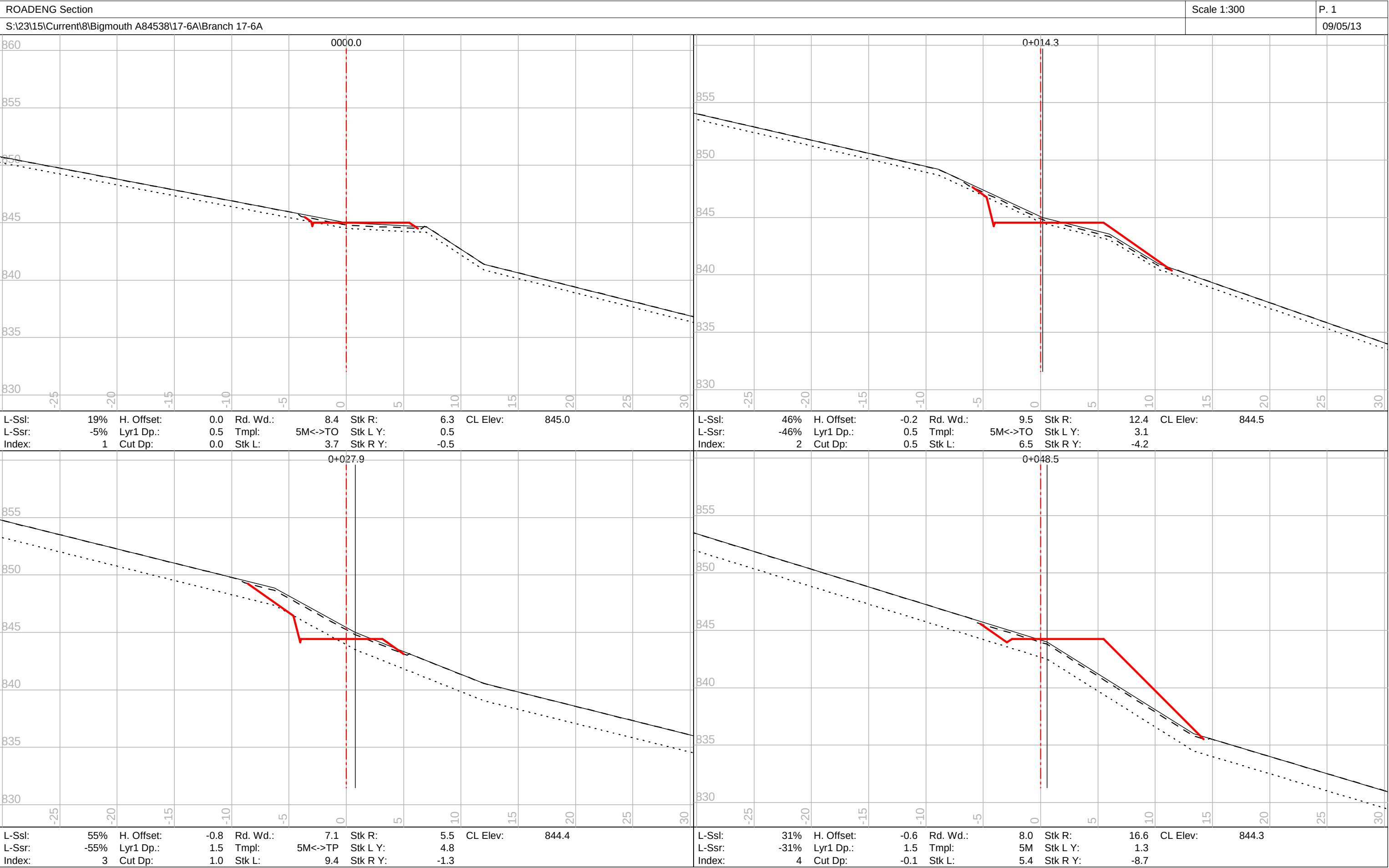
Design Date	09/04/09	Design By:	Ed Folk, RFT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

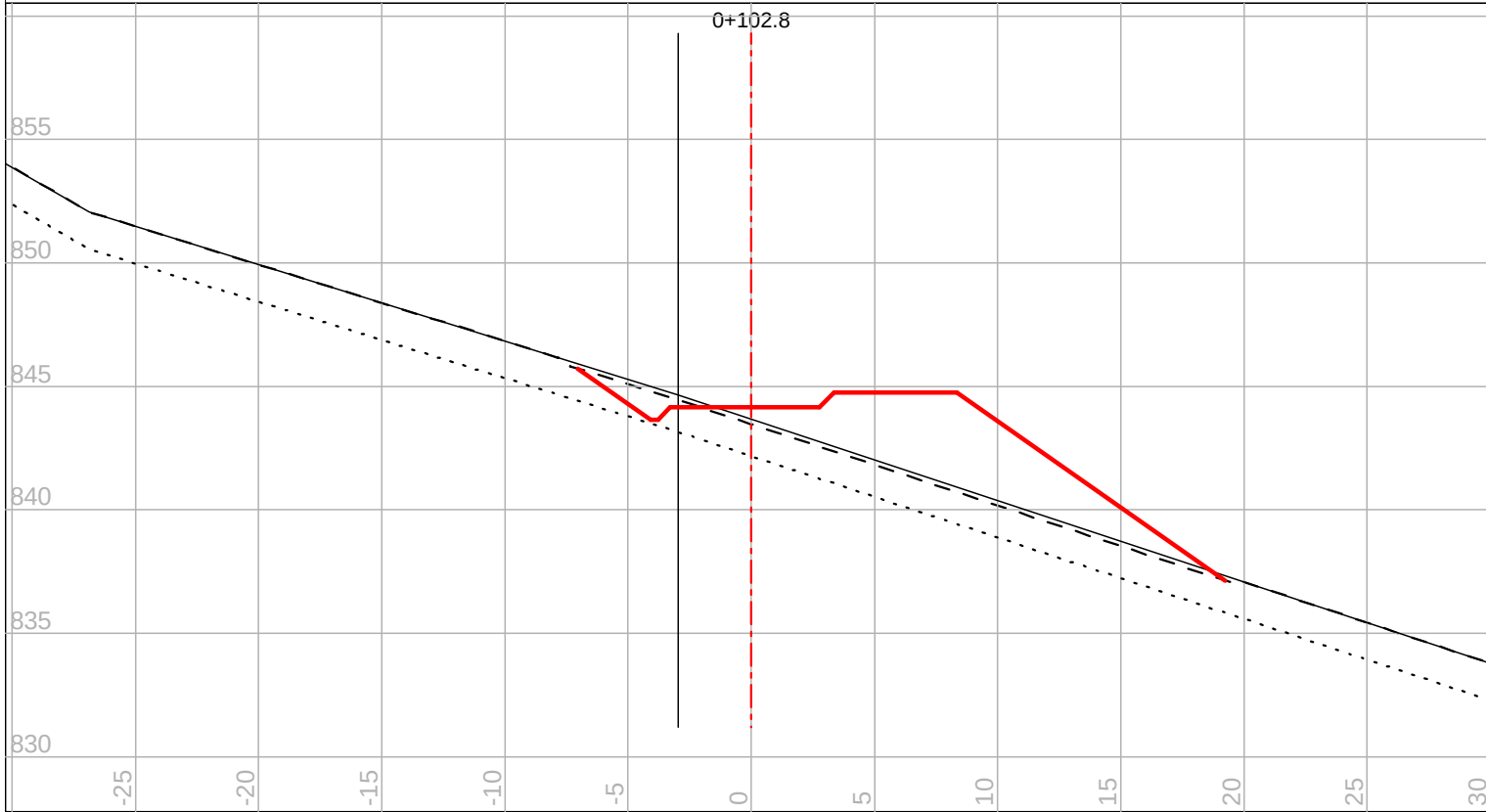
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Prepared By:
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PO Box 1012
Salmon Arm, BC
V1E 4R1
250-832-3366

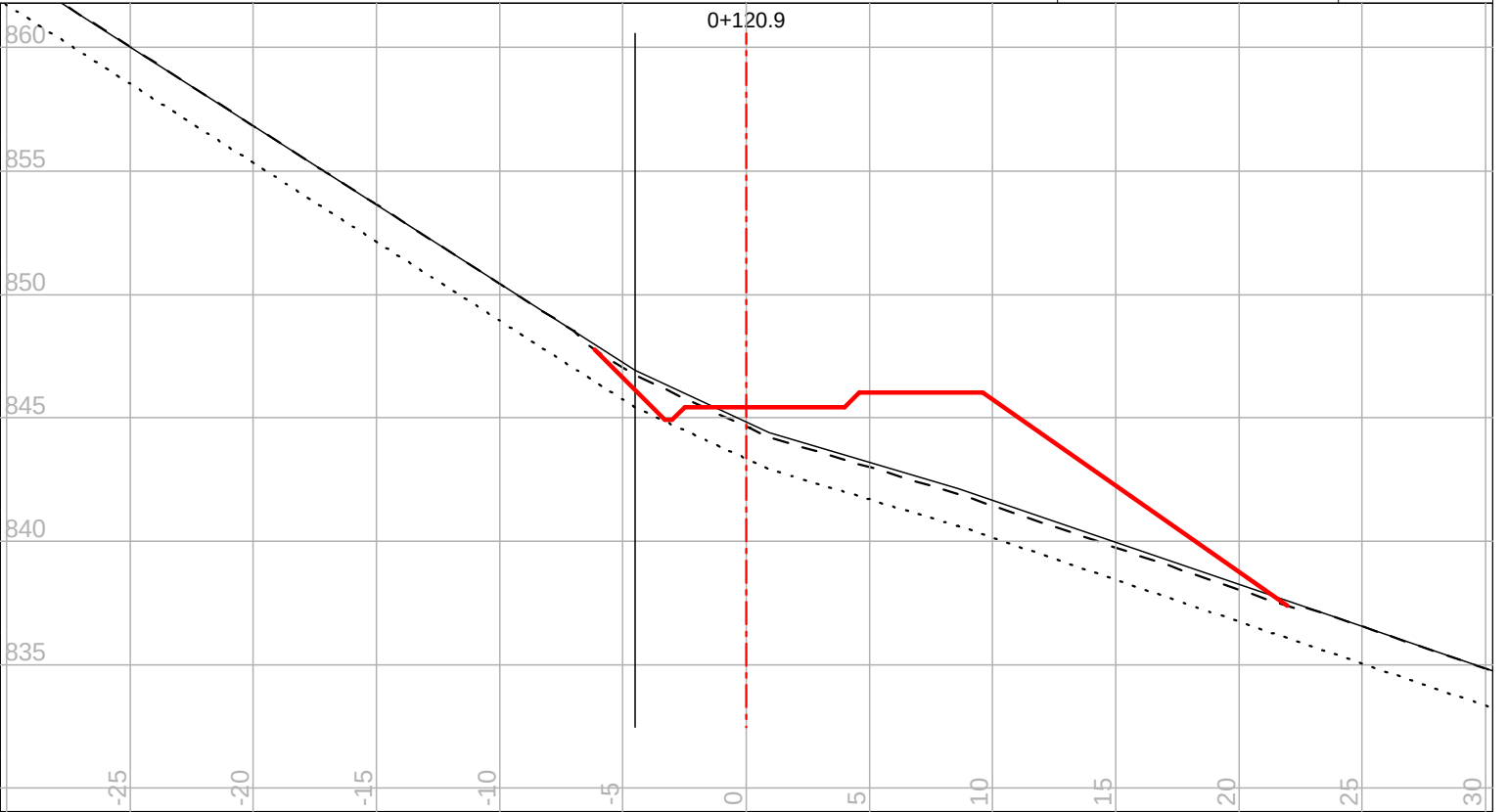


ROAD CROSS-SECTIONS

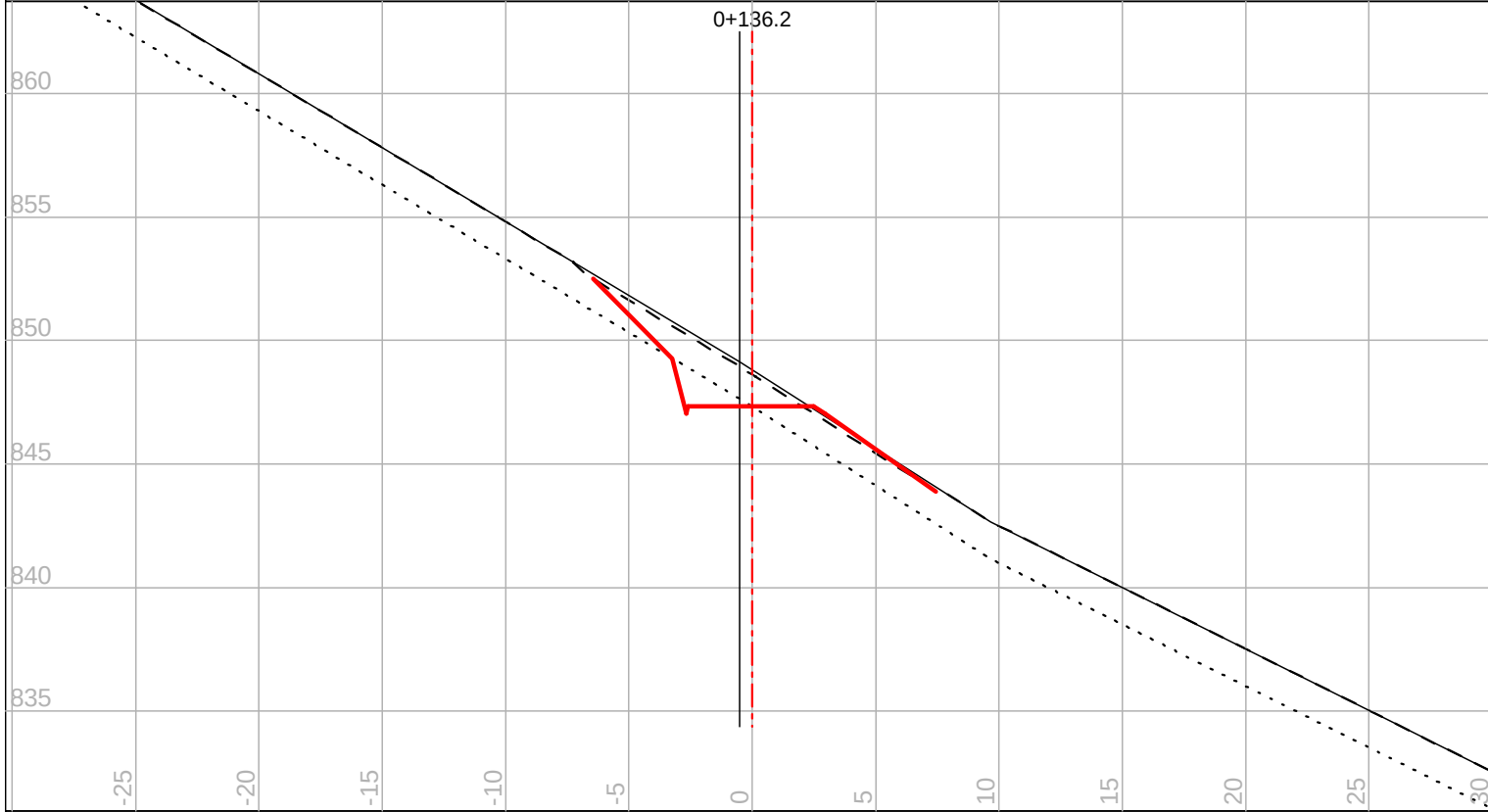




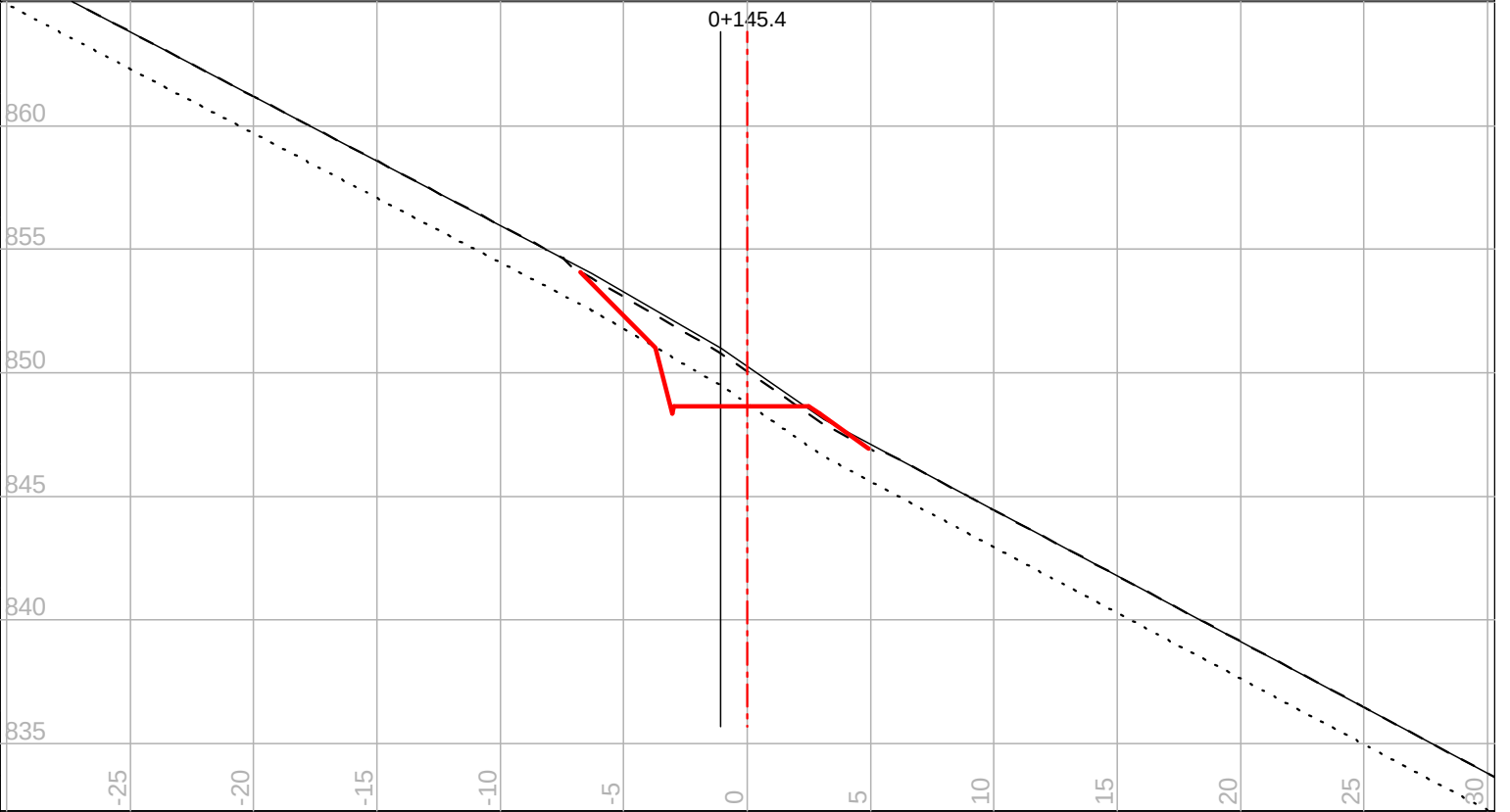
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L-Ssr:	-33%	Lyr1 Dp.:	1.5	Tmpl:	W7	Stk L Y:	1.6		
Index:	9	Cut Dp:	-0.5	Stk L:	7.3	Stk R Y:	-7.0		



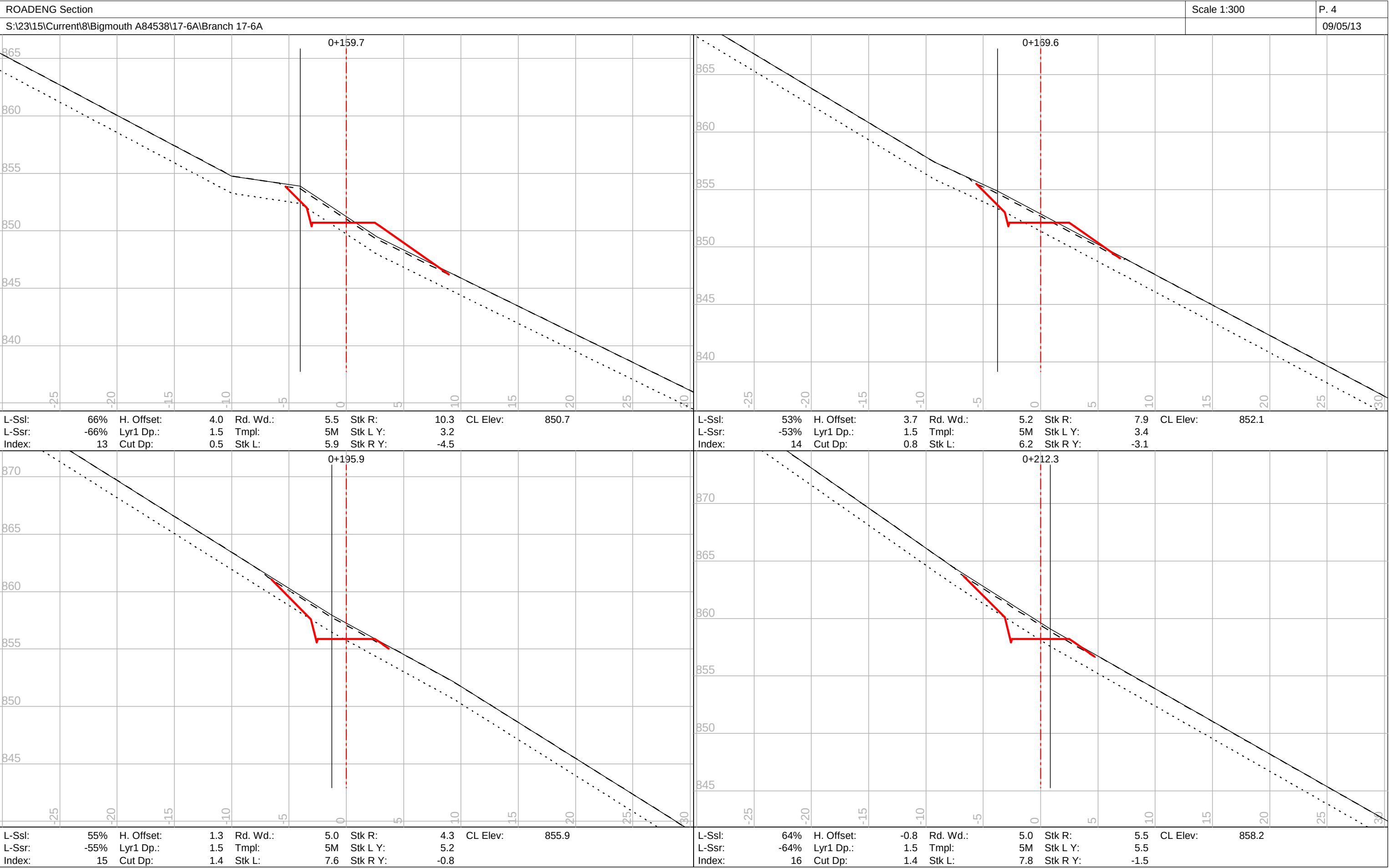
L-Ssl:	46%	H. Offset:	4.5	Rd. Wd.:	6.5	Stk R:	23.2	CL Elev:	845.4
L-Ssr:	-46%	Lyr1 Dp.:	1.5	Tmpl:	W7	Stk L Y:	2.3		
Index:	10	Cut Dp:	-0.6	Stk L:	6.8	Stk R Y:	-8.1		

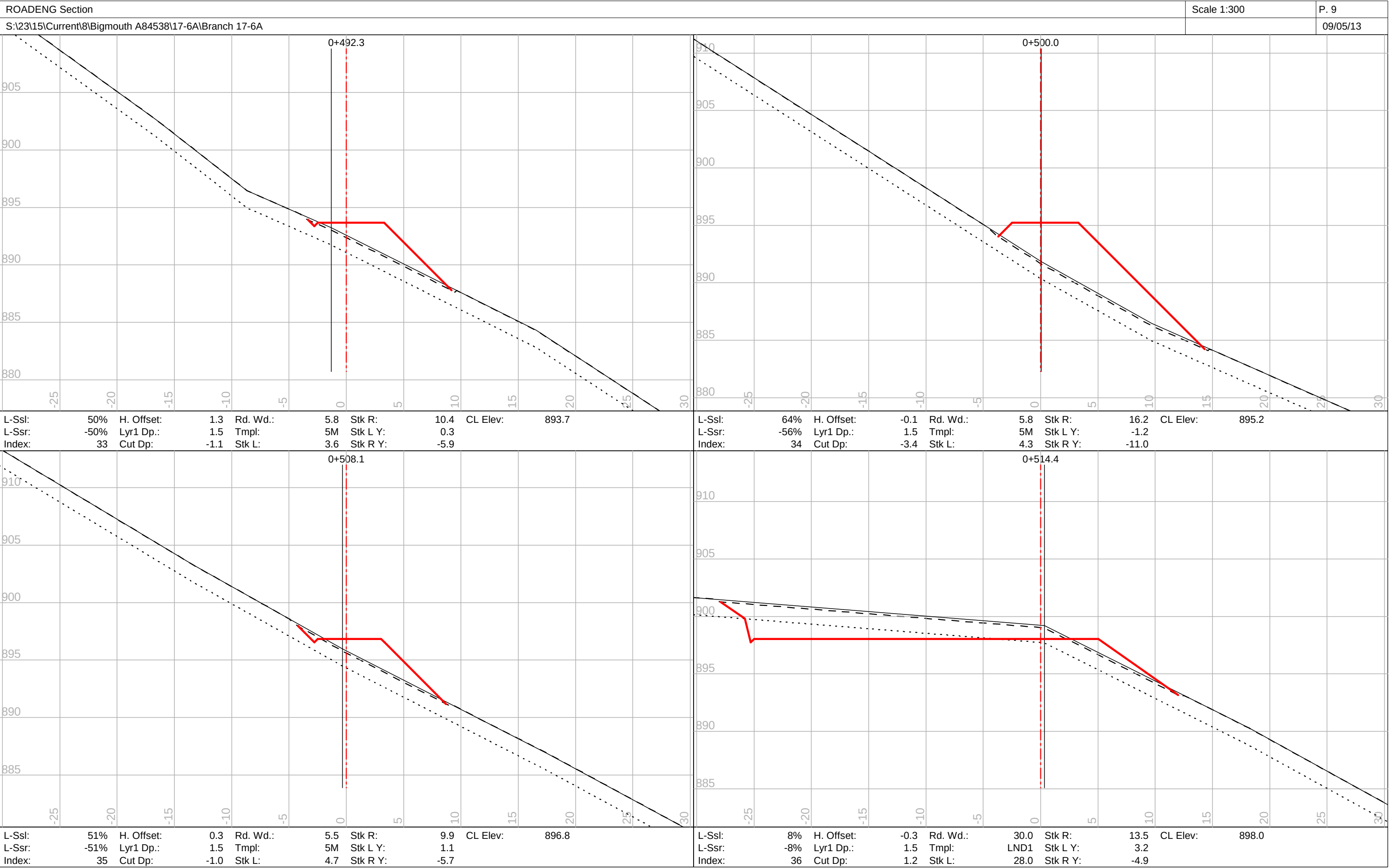


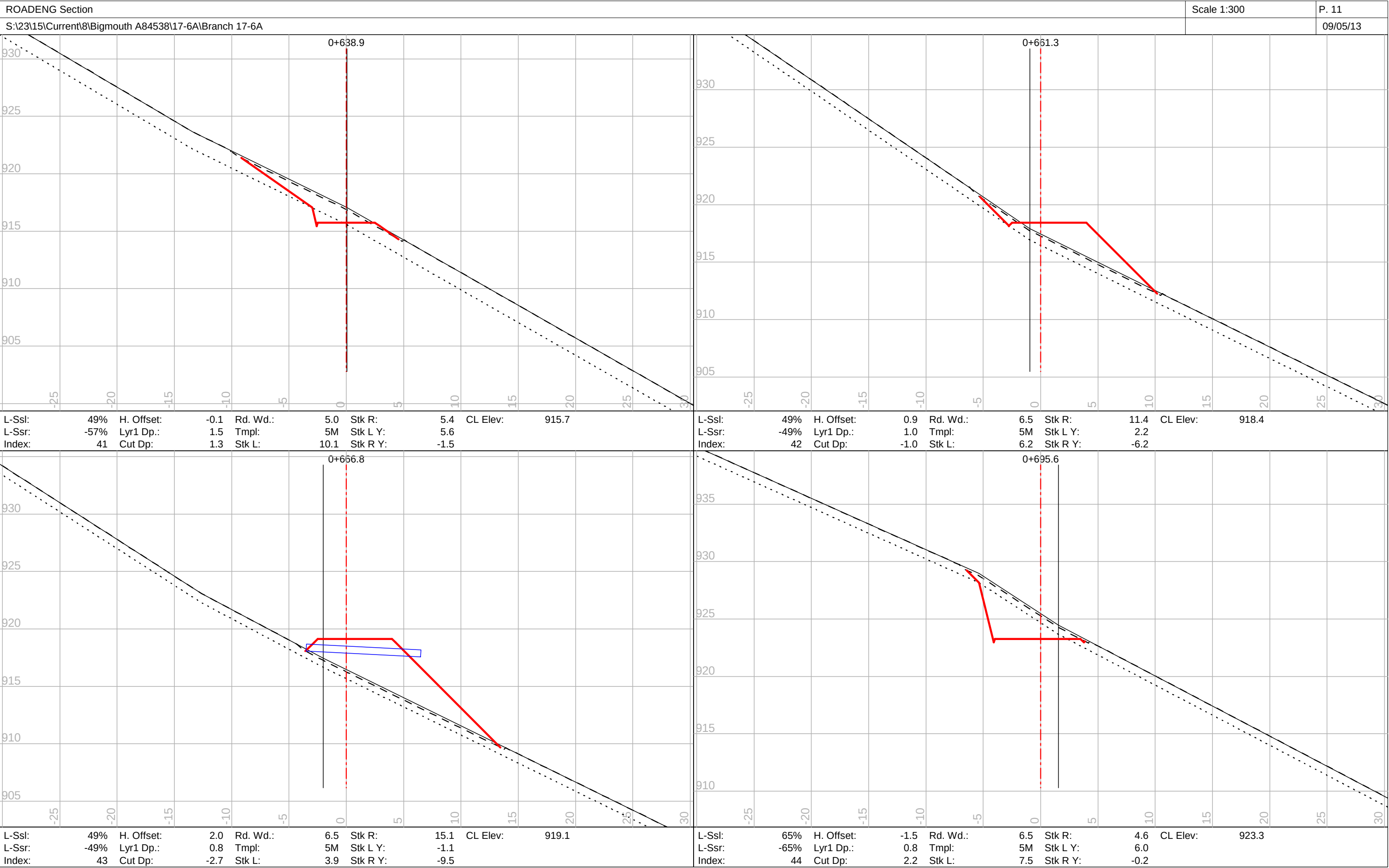
L-Ssl:	64%	H. Offset:	0.5	Rd. Wd.:	5.1	Stk R:	8.9	CL Elev:	847.3
L-Ssr:	-64%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	5.2		
Index:	11	Cut Dp:	1.5	Stk L:	7.4	Stk R Y:	-3.5		

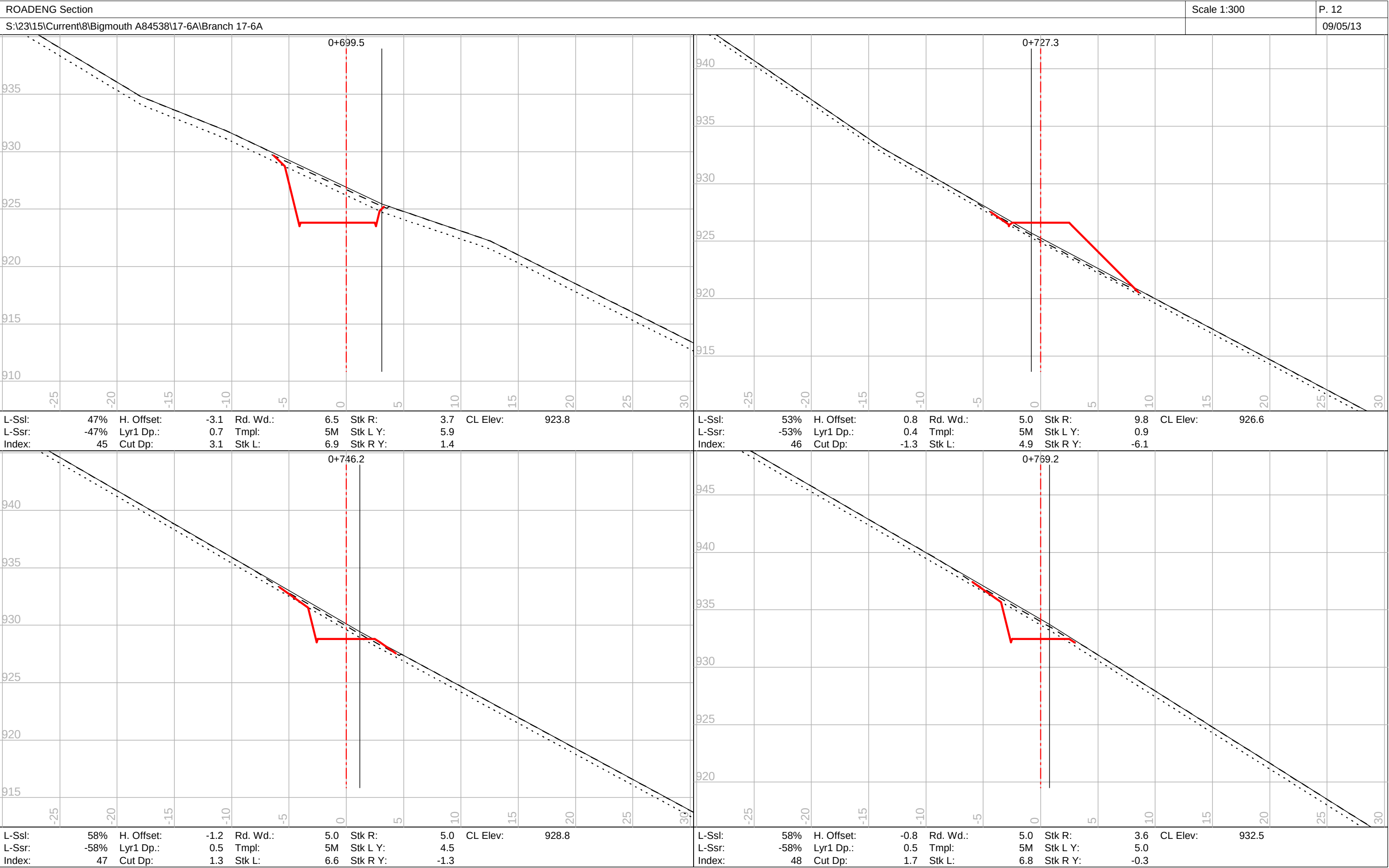


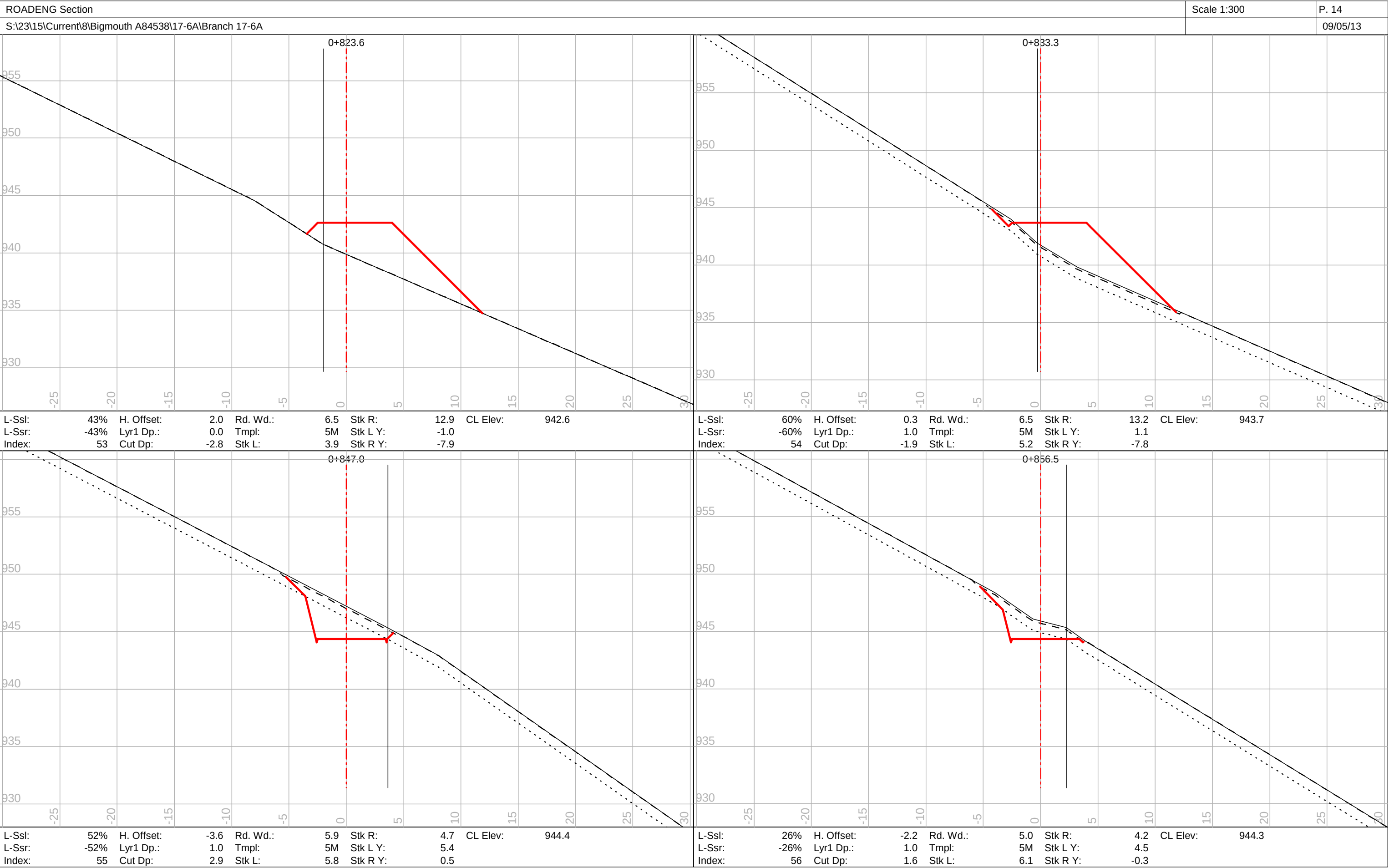
L-Ssl:	69%	H. Offset:	1.0	Rd. Wd.:	5.5	Stk R:	5.9	CL Elev:	848.7
L-Ssr:	-69%	Lyr1 Dp.:	1.5	Tmpl:	5M	Stk L Y:	5.4		
Index:	12	Cut Dp:	1.6	Stk L:	7.8	Stk R Y:	-1.7		

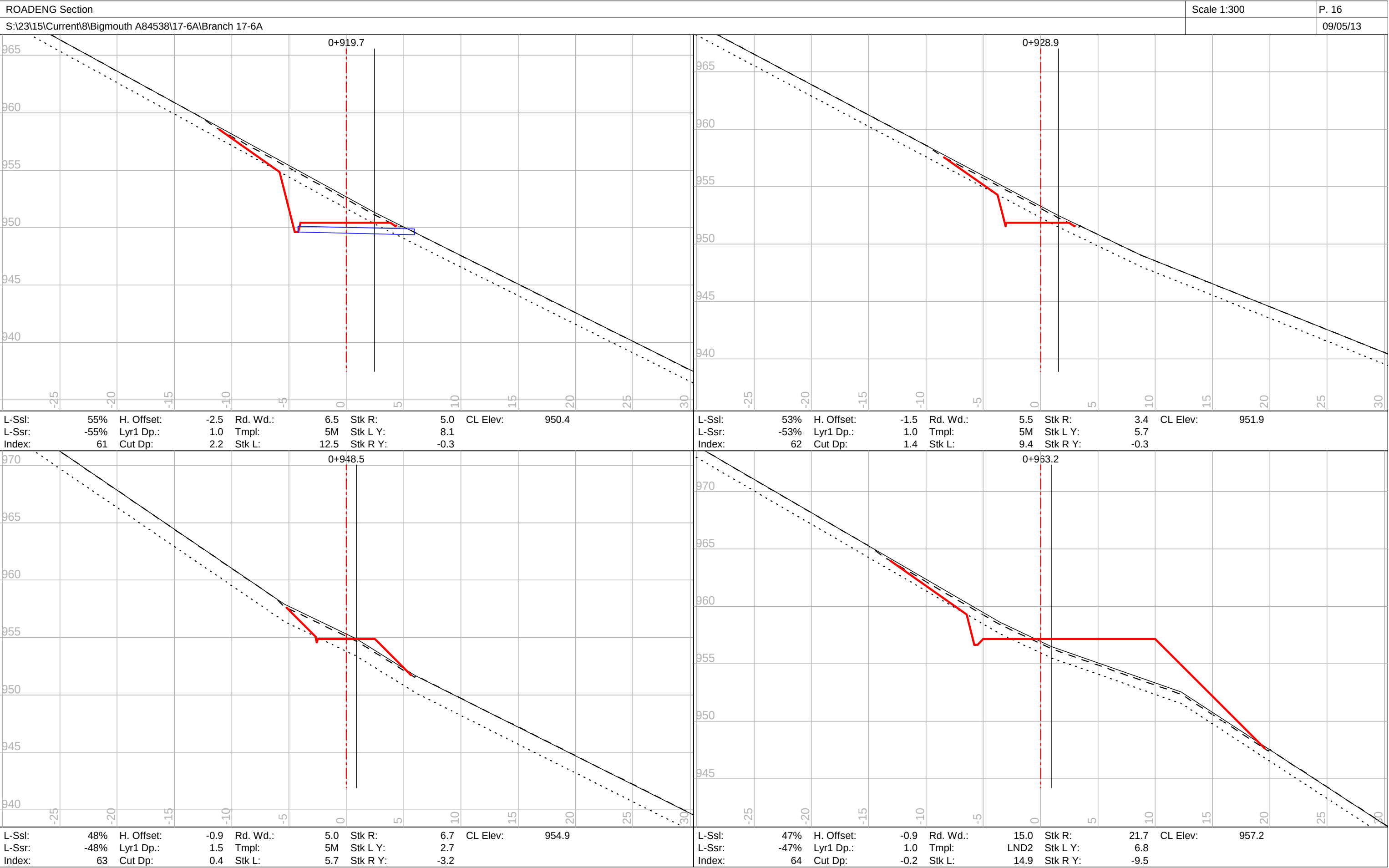


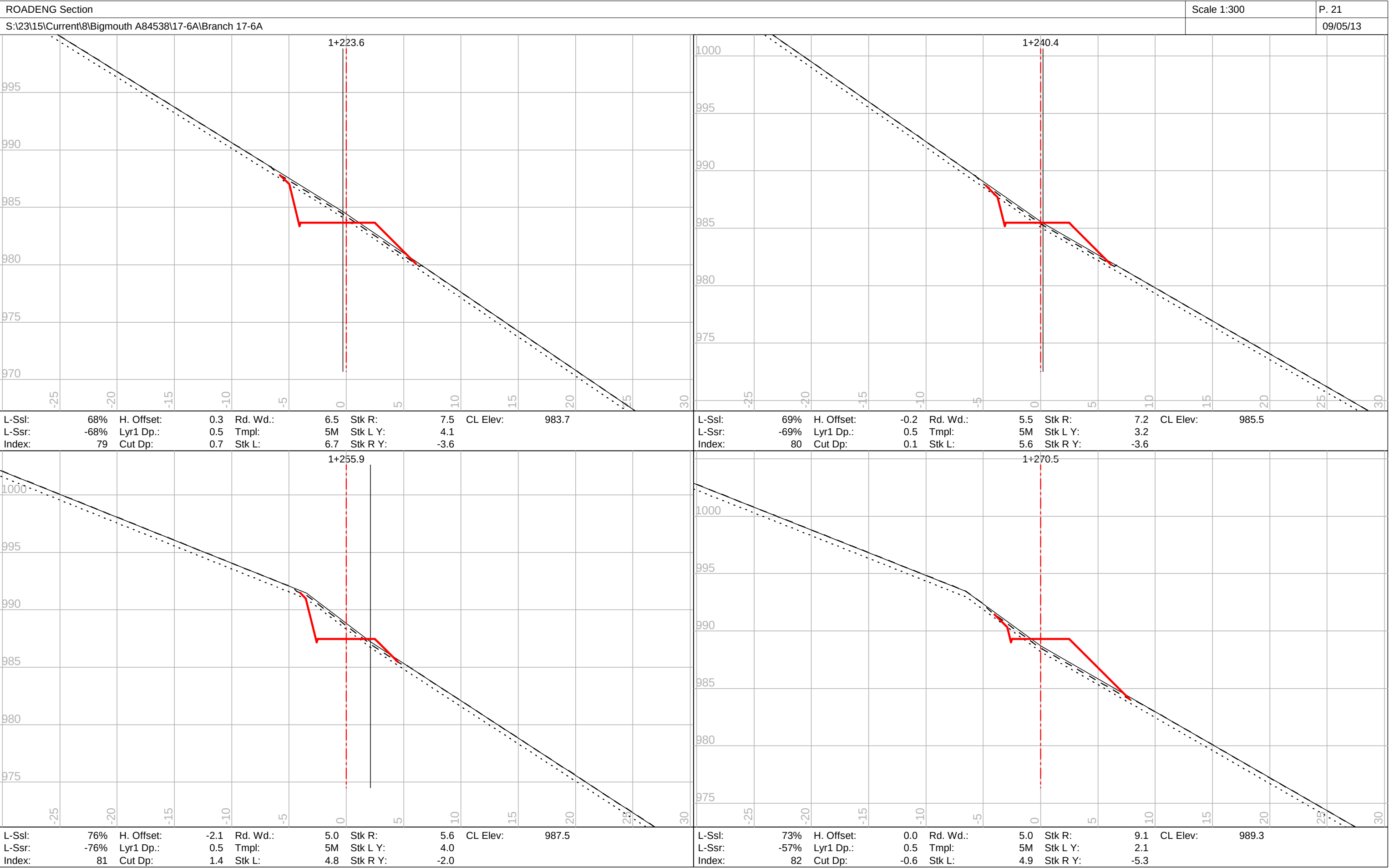












TRAVERSE NOTES

Description: Branch 17.6 A
 Crew: SE/TL/PW/MJ
 Unit: Blk K671
 Survey Date: Sept 2 /08
 Length: 1276.1m.
 Number of Shots: 95

Inde	Station	Type	Fore Azi	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	119	13.7	14.0	21.0								
12	144.8						59.0/6.0 T,53.0/..	-70.0/5.0 T,-54.0/..	TI/1.50/HR			403579.7	5745031.5	851.0
		FS	134	8.8	9.0	21.0								
11	136.0						60.0/..	-64.0/12.0 T,-50.0/..	TI/1.50/HR			403573.1	5745037.5	849.1
		FS	152	15.8	16.0	14.0								
10	120.1						64.0/..	-46.0/6.0 T,-30.0/8.0 T,-34.0/..	TI/1.50/HR			403565.1	5745051.4	846.9
		FS	118	18.9	19.0	12.0								
9	101.2						31.0/25.0 T,58.0/..	-33.0/..	TI/1.50/HR			403547.8	5745060.1	844.7
		FS	114	6.9	7.0	-16.0								
8	94.3						16.0/10.0 T,26.0/..	-32.0/5.0 T,-57.0/12.0 T,-40.0/..	TI/1.50/HR			403541.3	5745062.9	845.8
		FS	130	14.0	14.0	-4.0								
7	80.3						18.0/25.0 T,40.0/..	-34.0/15.0 T,-56.0/..	TI/1.50/HR			403530.1	5745071.7	846.3
		FS	186	16.9	17.0	11.0								
6	63.4						50.0/8.0 T,25.0/..	-43.0/6.0 T,-56.0/..	TI/1.50/HR			403531.3	5745088.4	844.5
		FS	178	8.2	9.0	46.0								
5	55.3						31.0/..	-28.0/..	TI/1.50/HR	1000	Str 'A'	403530.8	5745096.5	840.7
		FS	140	7.3	8.0	-45.0								
4	48.0						31.0/..	-63.0/15.0 T,-30.0/..	TI/1.50/HR			403525.9	5745102.0	844.0
		FS	134	20.3	20.3	-5.0								
3	27.7						55.0/8.0 T,25.0/..	-40.0/12.0 T,-25.0/..	TI/1.50/HR			403510.6	5745116.0	845.0
		FS	147	13.4	13.4	0.0								
2	14.3						46.0/10.0 T,23.0/..	-25.0/6.0 T,-60.0/5.0 T,-35.0/..	TI/0.50/HR			403502.9	5745127.1	845.0
		FS	165	14.3	14.3	0.0								
1:1	0.0:1								TI/0.50/HR		RT1	403528.5	5745128.1	845.0
		RS	113	32.4	32.4	0.0								
1*	0.0						19.0/..	-5.0/7.0 T,-65.0/6.0 T,-25.0/..	TI/0.50/HR		Existing rd comes in @ 152 deg @	403498.7	5745140.8	* 845.0

Inde	Station	Typ	Fore Azi	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	133	29.8	30.0	11.0								
25	347.3						48.0/10.0 T,57.0/..	-48.0/12.0 T,-55.0/..	TI/1.50/HR			403740.2	5744906.2	878.0
		FS	152	15.7	16.0	20.0								
24	331.6						34.0/4.0 T,76.0/16.0 T,6	-50.0/15.0 T,-47.0/..	TI/1.50/HR	500	Str 3 - NCD	403732.3	5744919.9	874.8
		FS	116	6.9	7.0	-14.0								
23	324.6						67.0/10.0 T,58.0/..	-49.0/6.0 T,-72.0/15.0 T,-20.0/..	TI/1.50/HR			403725.9	5744922.9	875.8
		FS	125	19.2	20.0	29.0								
22	305.4						25.0/4.0 T,63.0/..	-56.0/20.0 T,-50.0/..	TI/1.50/HR			403709.5	5744933.8	870.2
		FS	136	13.9	14.0	10.0								
21	291.5						63.0/..	-58.0/11.0 T,-63.0/10.0 T,-40.0/..	TI/1.50/HR			403699.4	5744943.7	868.8
		FS	132	12.9	13.0	9.0								
20:1	78.5:1								TI/1.50/HR		RT3	403707.6	5744957.5	867.7
		RS	74	19.0	19.0	0.0								
20	278.5						56.0/10.0 T,43.0/..	-66.0/16.0 T,-60.0/..	TI/1.50/HR		enters blk K670	403689.3	5744952.2	867.7
		FS	154	10.5	12.0	55.0								
19	268.0						44.0/15.0 T,70.0/..	-41.0/..	TI/1.50/HR	600	Str 'B'	403684.4	5744961.6	861.9
		FS	121	9.3	10.0	-40.0								
18	258.7						72.0/7.0 T,58.0/..	-50.0/20.0 T,-58.0/..	TI/1.50/HR			403676.1	5744966.3	865.6
		FS	124	18.9	19.0	11.0								
17:1	39.9:1								TI/1.50/HR		RT2	403676.9	5744990.6	863.5
		RS	51	22.0	22.0	0.0								
17	239.9						67.0/..	-67.0/..	TI/1.50/HR			403659.8	5744976.7	863.5
		FS	125	29.7	30.0	15.0								
16	210.2						64.0/10.0 T,70.0/..	-57.0/..	TI/1.50/HR			403634.6	5744993.5	859.1
		FS	130	16.0	16.0	7.0								
15	194.2						63.0/..	-55.0/12.0 T,-63.0/..	TI/1.50/HR			403621.8	5745003.6	858.0
		FS	128	25.8	26.0	12.0								
14	168.4						46.0/6.0 T,60.0/..	-53.0/..	TI/1.50/HR			403600.6	5745019.3	854.9
		FS	125	10.0	10.0	10.0								
13	158.5						15.0/6.0 T,53.0/..	-66.0/8.0 T,-49.0/..	TI/1.50/HR			403592.1	5745024.9	853.9

Inde	Station	Typ	Fore Azi	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	144	18.3	19.0	28.0								
38	554.4						76.0/..	-34.0/..	TI/1.50/HR			403892.6	5744767.1	903.9
		FS	110	17.0	17.0	4.0								
37	537.4						51.0/15.0 T,44.0/..	-53.0/..	TI/1.50/HR			403876.1	5744772.8	903.2
		FS	143	28.7	29.0	14.0								
36	508.7						8.0/62.0 T,0.0/..	-50.0/20.0 T,-55.0/..	TI/1.50/HR			403857.8	5744795.5	899.2
		FS	154	6.2	7.0	52.0								
35:1	02.5:1								TI/1.50/HR		RT5	403867.9	5744808.5	897.0
		RS	60	15.0	15.0	7.0								
35	502.5						56.0/15.0 T,60.0/..	-51.0/20.0 T,-54.0/..	T2/1.50/HR		LDG 1	403854.9	5744801.0	896.0
		FS	144	8.0	9.0	52.0								
34	494.5						64.0/..	-56.0/11.0 T,-44.0/..	T2/1.50/HR			403849.9	5744807.4	891.8
		FS	150	7.9	8.0	-18.0								
33	486.6						44.0/8.0 T,78.0/10.0 T,7	-50.0/20.0 T,-65.0/..	T2/1.50/HR			403845.8	5744814.2	893.2
		FS	124	14.0	14.0	6.0								
32:1	72.6:1								T2/1.50/HR		RT4	403838.9	5744837.0	892.4
		RS	19	16.0	16.0	0.0								
32	472.6						67.0/18.0 T,60.0/..	-63.0/7.0 T,-70.0/11.0 T,-60.0/..	T2/1.50/HR			403833.7	5744821.9	892.4
		FS	126	17.4	18.0	26.0								
31	455.2						63.0/..	-44.0/..	T2/1.50/HR			403819.0	5744832.0	887.9
		FS	127	20.9	21.0	11.0								
30	434.3						63.0/..	-62.0/8.0 T,-51.0/..	TI/1.50/HR			403801.7	5744844.4	885.6
		FS	135	9.9	10.0	16.0								
29	424.5						67.0/7.0 T,64.0/..	-75.0/24.0 T,-50.0/..	TI/1.50/HR			403794.4	5744851.3	884.0
		FS	169	8.4	9.0	40.0								
28	416.1						57.0/10.0 T,65.0/..	-56.0/..	TI/1.50/HR	500	Str 4 -NCD	403792.5	5744859.4	880.7
		FS	136	9.2	10.0	-42.0								
27	406.9						75.0/5.0 T,44.0/5.0 T,68	-56.0/8.0 T,-78.0/15.0 T,-50.0/..	TI/1.50/HR			403785.8	5744866.0	884.5
		FS	133	29.8	30.0	11.0								
26	377.1						57.0/15.0 T,63.0/..	-47.0/9.0 T,-54.0/10.0 T,-43.0/..	TI/1.50/HR			403763.0	5744886.1	881.3

Inde	Station	Typ	Fore Azi	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	125	8.9	9.0	-15.0								
51	805.5						68.0/10.0 T,40.0/..	-48.0/6.0 T,-70.0/..	T2/1.00/HR			404069.5	5744604.0	941.4
		FS	108	8.4	9.0	39.0								
50	797.1						76.0/8.0 T,55.0/..	-65.0/..	T2/1.00/HR			404061.7	5744606.6	938.2
		FS	99	9.0	9.0	8.0								
49:1	88.1:1								TI/0.50/HR		RT7	404058.9	5744625.0	937.4
		RS	19	18.0	18.0	0.0								
49*	788.1						73.0/..	-68.0/8.0 T,-71.0/10.0 T,-60.0/..	TI/0.50/HR		CB / RD JCN	404053.0	5744608.0	937.4
		FS	113	24.7	25.0	15.0								
48	763.4						58.0/..	-63.0/..	TI/0.50/HR			404029.4	5744617.5	933.7
		FS	115	22.6	23.0	19.0								
47	740.8						58.0/..	-54.0/..	TI/0.50/HR			404008.2	5744626.8	929.4
		FS	132	18.6	19.0	20.0								
46:1	22.2:1								TI/0.40/HR		RT6	404008.5	5744655.5	925.7
		RS	42	22.0	22.0	0.0								
46	722.2						57.0/15.0 T,68.0/..	-53.0/..	TI/0.40/HR			403993.8	5744639.2	925.7
		FS	125	28.0	28.0	1.0								
45	694.2						47.0/15.0 T,40.0/8.0 T,6	-34.0/10.0 T,-50.0/..	T2/0.70/HR		D/L 7 crosses rd - stn 0+484	403969.9	5744655.0	925.4
		FS	174	4.9	5.0	20.0								
44	689.3						68.0/8.0 T,47.0/..	-55.0/..	T2/0.80/HR			403969.2	5744659.8	924.5
		FS	175	29.2	30.0	24.0								
43	660.1						53.0/12.0 T,64.0/..	-49.0/..	T2/0.80/HR	500	Str 1 - S6	403965.7	5744688.7	917.5
		FS	143	6.0	6.0	-8.0								
42	654.1						69.0/..	-50.0/..	T2/1.00/HR			403961.9	5744693.4	917.9
		FS	135	22.0	22.0	4.0								
41	632.1						49.0/15.0 T,59.0/..	-57.0/..	TI/1.50/HR			403945.7	5744708.8	917.1
		FS	138	29.6	30.0	16.0								
40	602.5						53.0/..	-52.0/14.0 T,-58.0/..	TI/1.50/HR			403924.9	5744730.5	912.3
		FS	138	29.8	30.0	11.0								
39	572.7						63.0/..	-46.0/6.0 T,-54.0/..	TI/1.50/HR		D/L 5 crosses rd - stn 0+185	403903.9	5744752.5	909.0

Inde	Station	Typ	Fore Azi	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	115	17.9	18.0	11.0								
65	991.4						54.0/..	-55.0/..	TI/1.00/HR			404150.9	5744455.3	962.4
		FS	127	29.4	30.0	20.0								
64	962.0						47.0/5.0 T,58.0/..	-35.0/12.0 T,-65.0/..	TI/1.00/HR		Landing 4 - 20x20	404128.0	5744473.1	956.5
		FS	129	14.9	15.0	11.0								
63	947.1						48.0/7.0 T,68.0/..	-62.0/6.0 T,-50.0/..	TI/1.00/HR			404116.7	5744482.6	954.9
		FS	127	19.9	20.0	12.0								
62:1	27.3:1								TI/1.00/HR		RT 8	404113.6	5744510.3	952.5
		RS	38	20.0	20.0	0.0								
62	927.3						53.0/..	-48.0/8.0 T,-40.0/..	TI/1.00/HR			404101.3	5744494.6	952.5
		FS	124	9.9	10.0	12.0								
61	917.3						55.0/..	-50.0/..	TI/1.00/HR		pot full bench	404093.3	5744500.2	951.3
		FS	152	22.9	23.0	9.0								
60	894.4						55.0/8.0 T,49.0/..	-70.0/..	T2/1.00/HR			404083.0	5744520.5	949.2
		FS	167	11.9	12.0	12.0								
59	882.5						66.0/..	-65.0/..	T2/1.00/HR			404080.6	5744532.1	947.8
		FS	181	9.0	9.0	9.0								
58	873.5						58.0/..	-72.0/4.0 T,-62.0/..	T2/1.00/HR			404080.9	5744541.1	947.0
		FS	188	9.7	10.0	24.0								
57	863.8						90.0/2.0 T,60.0/..	-60.0/..	T2/1.00/HR			404082.5	5744550.7	944.7
		FS	172	11.0	11.0	-6.0								
56	852.8						26.0/3.0 T,70.0/4.0 T,55	-70.0/2.0 T,-62.0/..	T2/1.00/HR			404081.2	5744561.6	945.3
		FS	169	10.0	10.0	0.0								
55	842.8						52.0/..	-55.0/5.0 T,-70.0/..	T2/1.00/HR		poc full bench	404079.5	5744571.5	945.3
		FS	188	13.6	14.0	25.0								
54	829.3						93.0/3.0 T,65.0/..	-62.0/4.0 T,-45.0/..	T2/1.00/HR			404081.6	5744585.0	941.9
		FS	163	9.9	10.0	12.0								
53	819.3						65.0/7.0 T,50.0/..	-44.0/..	T2/0.00/HR		[N]str 6 sta 3	404079.0	5744594.5	940.7
		FS	150	5.0	5.0	13.0								
52	814.4						40.0/..	-50.0/10.0 T,-65.0/..	T2/0.00/HR	800	Str 'C' - S6	404076.6	5744598.8	940.1

Inde	Station	Typ	Fore Azi	H.D.	S.D.	Slp.(%)	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	153	20.0	20.0	5.0								
77	1192.4						58.0/..	-84.0/15.0 T,-35.0/..	T2/0.50/HR		poc full bench; edge of draw	404318.1	5744360.0	982.5
		FS	165	12.5	13.0	30.0								
76	1179.9						54.0/..	-40.0/2.0 T,-70.0/6.0 T,-35.0/..	T2/0.50/HR	500	dry draw	404315.2	5744372.1	978.8
		FS	115	15.9	16.0	-12.0								
75:2	1171.0						78.0/12.0 T,20.0/..	-82.0/10.0 T,-50.0/..	T2/0.50/HR			404307.3	5744375.8	981.0
		IFS	115	7.0	7.0	5.0								
75:1	64.0:1								T2/0.50/HR		RT 9	404316.7	5744392.9	980.7
		RS	48	21.0	21.0	0.0								
75	1164.0						50.0/6.0 T,80.0/6.0 T,55	-53.0/..	T2/0.50/HR		[N]gully edge	404301.1	5744378.8	980.7
		FS	126	5.6	6.0	41.0								
74	1158.5						74.0/7.0 T,60.0/..	-45.0/7.0 T,-65.0/..	T2/0.50/HR			404296.7	5744382.1	978.4
		FS	113	18.0	18.0	-1.0								
73	1140.5						62.0/10.0 T,56.0/..	-62.0/..	T2/0.50/HR			404280.6	5744389.2	978.6
		FS	122	26.8	27.0	12.0								
72:1	1125.6						70.0/10.0 T,60.0/..	-60.0/4.0 T,-55.0/..	T2/0.50/HR			404268.3	5744397.1	976.5
		IFS	122	11.9	12.0	10.0								
72	1113.7						75.0/12.0 T,60.0/..	-57.0/..	T2/0.50/HR		pot full bench	404258.4	5744403.5	975.4
		FS	108	14.9	15.0	12.0								
71	1098.8						67.0/..	-65.0/..	T2/0.50/HR			404244.5	5744408.1	973.6
		FS	117	7.9	8.0	15.0								
70	1090.9						74.0/..	-68.0/8.0 T,-40.0/..	T2/0.50/HR			404237.6	5744411.7	972.4
		FS	103	16.0	16.0	2.0								
69	1074.9						63.0/..	-45.0/3.0 T,-66.0/..	T2/0.50/HR			404222.4	5744415.4	972.1
		FS	117	22.7	23.0	15.0								
68	1052.1						72.0/6.0 T,55.0/..	-53.0/7.0 T,-65.0/..	T2/0.50/HR		poc full bench	404202.6	5744425.8	968.6
		FS	119	24.9	25.0	10.0								
67	1027.2						55.0/5.0 T,72.0/8.0 T,60	-46.0/..	T2/0.50/HR			404181.4	5744437.9	966.2
		FS	123	17.9	18.0	10.0								
66	1009.3						54.0/..	-53.0/..	TI/0.50/HR			404166.7	5744447.7	964.4

[illegible]

CULVERT SUMMARY

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
5	0+055.8	1000	16	90
8	0+095.5	500	11	90
19	0+271.6	600	11	90
24	0+335.9	500	9	90
28	0+421.0	500	10	90
37	0+543.4	500	11	125
43	0+666.8	600	10	90
52	0+819.4	800	10	90
61	0+919.7	500	12	122
66	1+009.6	500	9	120
71	1+097.2	500	8	118
76	1+176.1	500	10	90

Totals

# of Culver	Dia (mm)	Length (m)
8	500	90
1	600	11
1	800	10
1	1000	16

APPENDIX 3

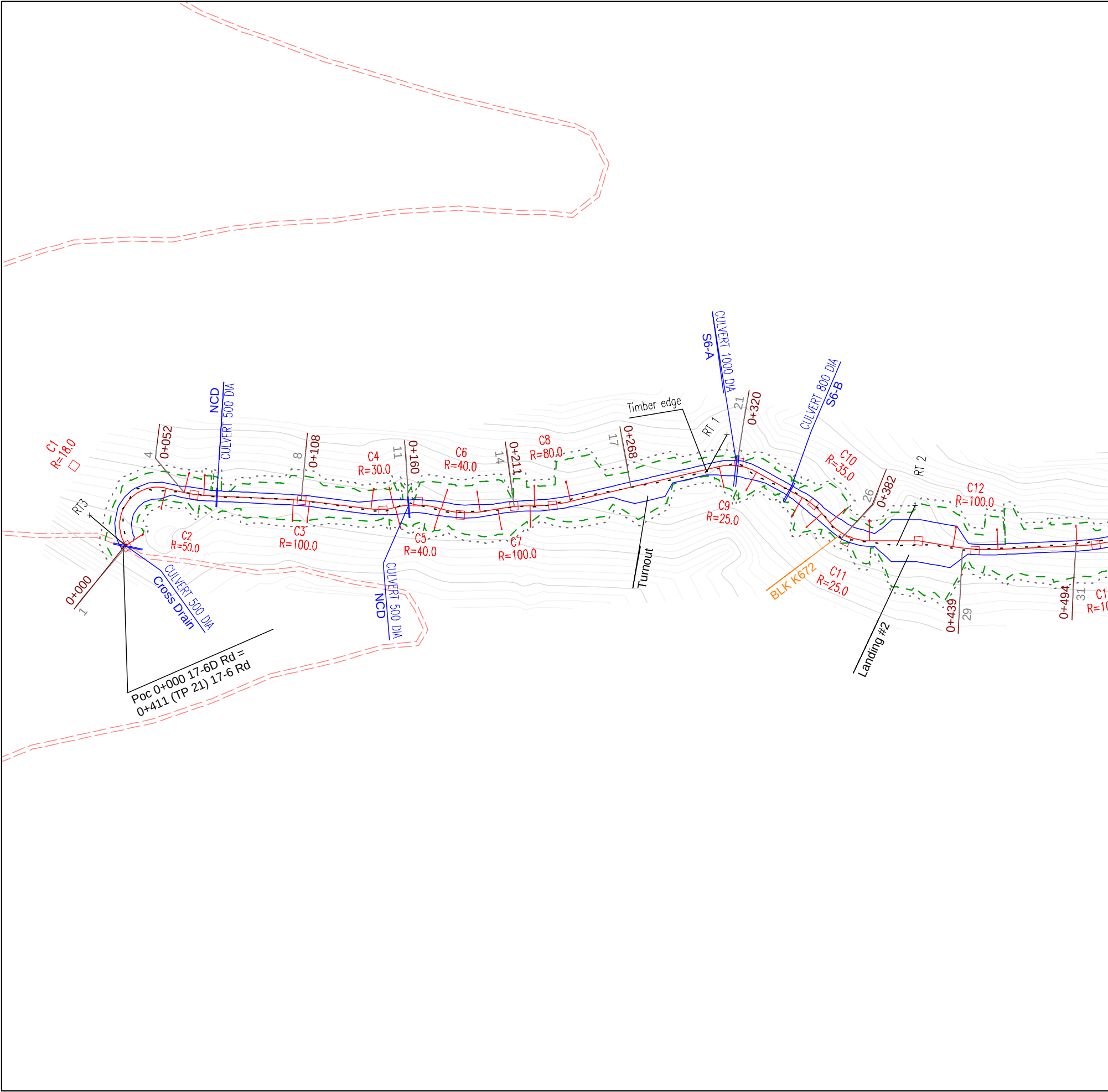
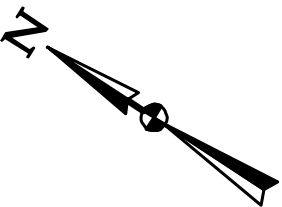
Branch 17.6D

Level 2 Geometric Road Design

Bigmouth 17.6D Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+000	1	TI	HR		0.0	197	97	0
0+018	2	TI	HR		1.5	283	0	117
0+029	3	TI	HR		3.4	779	0	442
0+052	4	TI	HR		3.5	164	97	381
0+068	5	TI	HR		-2.3	7	117	454
0+078	6	TI	HR		-0.5	31	231	314
0+097	7	TI	HR		-1.1	33	224	111
0+108	8	TI	HR		-1.3	80	189	-79
0+122	9	TI	HR		0.1	215	68	-186
0+148	10	TI	HR		1.0	77	132	-17
0+160	11	TI	HR		-2.3	198	221	-97
0+181	12	TI	HR		1.3	334	204	-141
0+205	13	TI	HR		0.2	52	75	4
0+211	14	TI	HR		-1.5	102	87	-18
0+223	15	TI	HR		1.0	242	109	1
0+243	16	TI	HR		-0.4	221	321	138
0+268	17	TI	HR		-0.8	100	249	39
0+283	18	TI	HR		1.1	245	15	-107
0+305	19	TI	HR		1.5	50	107	153
0+315	20	TI	HR		-0.9	0	220	79
0+320	21	TI	HR		-4.4	31	337	-195
0+329	22	TI	HR		1.6	192	30	-579
0+344	23	TI	HR		1.6	22	15	-386
0+348	24	TI	HR		-1.8	9	60	-379
0+355	24:1	TI	HR		0.2	63	178	-443
0+365	25	TI	HR		-0.1	293	80	-549
0+382	26	TI	HR		2.7	459	191	-275
0+408	27	TI	HR		0.6	550	625	88
0+425	28	TI	HR		-0.3	572	645	120
0+439	29	TI	HR		1.7	173	170	148
0+460	29:1	TI	HR		-1.3	50	147	167
0+469	30	TI	HR		-0.2	157	355	72
0+494	31	TI	HR		-0.1	103	269	-119
0+512	32	T2	HR		-0.2	124	75	-279
0+526	33	T2	HR		1.5	191	7	-218
0+542	34	T2	HR		1.1	277	47	-8
0+567	35	T2	HR		1.2	44	38	248
0+573	35:1	T2	HR		-0.8	126	21	250
0+582	36	T2	HR		3.4	212	49	368
0+597	37	T2	HR		-0.9	32	359	551
0+611	38	TI	HR		-1.9	146	368	175
0+628	39	TI	HR		1.5	138	105	-33
0+638	39:1	TI	HR		-1.1	72	173	15
0+646	40	TI	HR		0.0	75	113	-82
0+656	40:1	TI	HR		0.3	65	33	-114
0+663	41	TI	HR		1.5	236	188	-76
0+674	41:1	TI	HR		-1.0	253	176	-42
0+683	42	TI	HR		1.2	260	243	32

Bigmouth 17.6D Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+696	43	T2	HR		-1.8	10	159	29
0+706	44	T2	HR		-1.2	171	102	-159
0+724	45	T2	HR		2.1	240	7	-93
0+742	46	T2	HR		1.0	33	104	174
0+751	47	T2	HR		-2.0	0	101	80
0+755	47:1	T2	HR		-2.7	24	162	-46
0+767	48	T2	HR		0.0	144	103	-220
0+788	49	T2	HR		0.1	178	38	-175
0+803	50	T2	HR		1.4	149	121	-8
0+821	51	TI	HR		-0.7	63	95	18
0+832	51:1	TI	HR		0.9	72	50	-22
0+839	52	TI	HR		1.5	106	74	14
0+853	53	TI	HR		0.0	63	179	67
0+874	54	TI	HR		-0.5			-39

PLAN AND PROFILE SHEETS

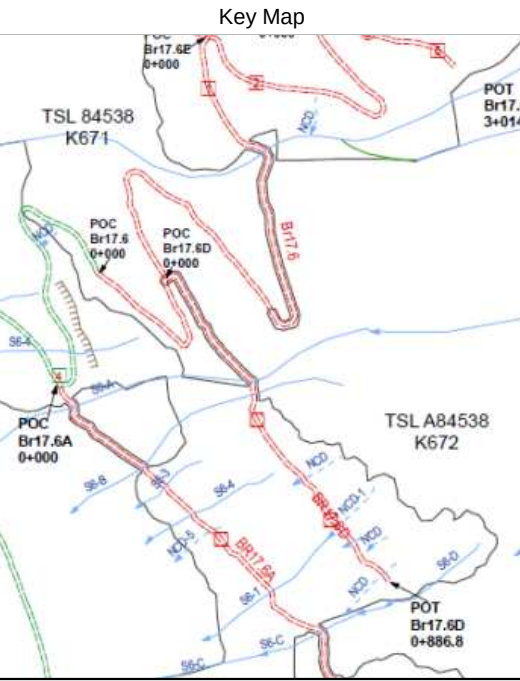


Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

- Legend**
- L-Line Location
 - P-line Location
 - Road Edges
 - Slope Stake Elevation
 - Clearing Limits
 - Culverts
 - RT
 - 2m Contours
 - Proposed Road

Plan Scale 1:2000



TSL A84538
Bigmouth
Proposed Branch 17.6D
UBI - 40BK672

Level 2 Road Survey
1 - 0+000 to 54 - 0+874

Design Template Key	
Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

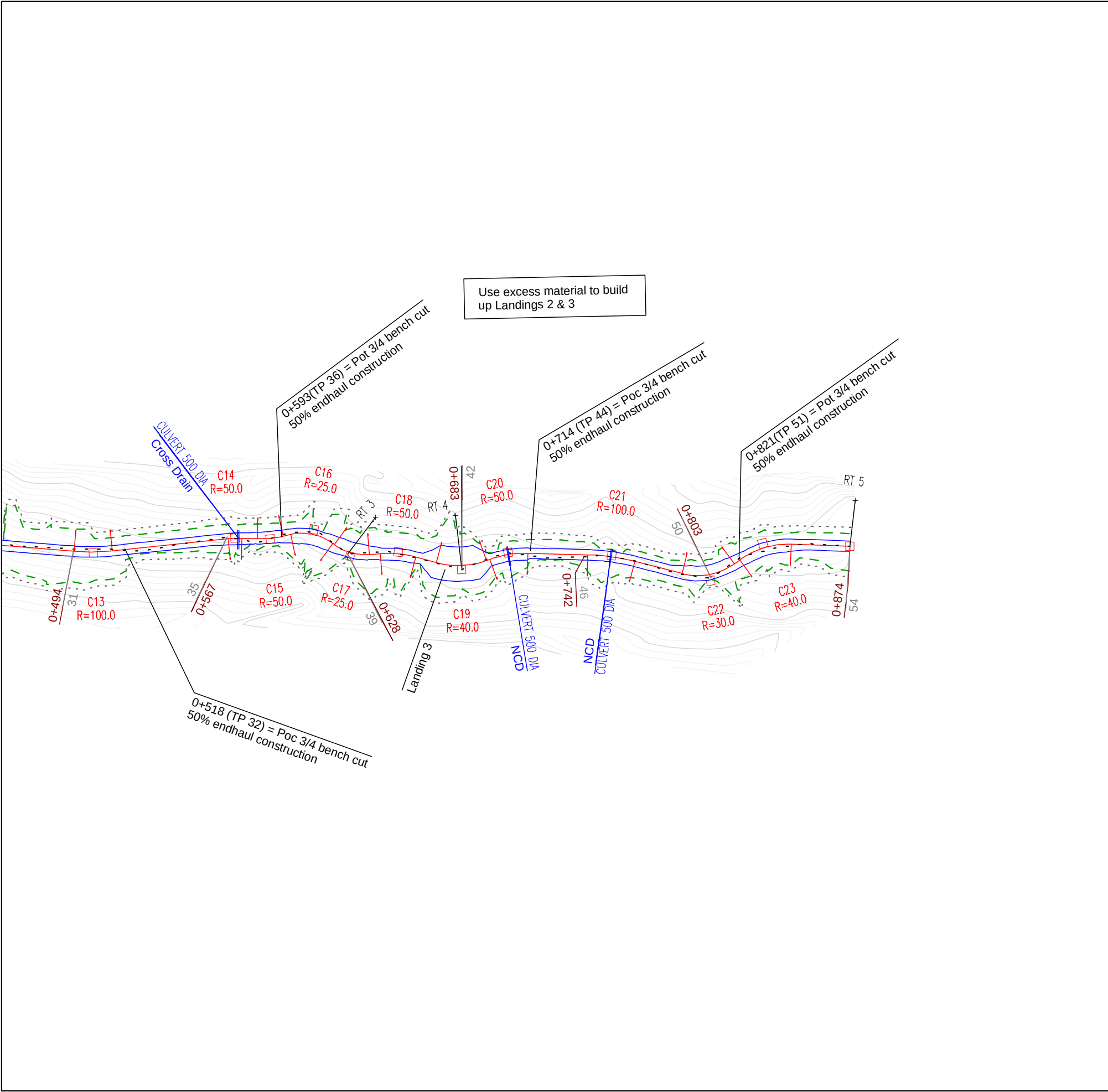
Culvert Summary				
Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
1	0+000.0	500	14.0	135
5	0+067.9	500	9.0	90
11	0+160.1	500	10.0	90
21	0+319.9	1000	15.0	90
	0+348.1	800	10.0	90

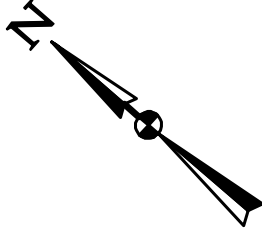
Reference Point Summary					
Index	P-Stn m.	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
1	0+000.0	0+000.0	7.0°	23.0	RT3
19	0+308.5	0+305.2	85.0°	20.0	RT 1
27	0+414.5	0+407.6	81.0°	21.0	RT 2

Page 1 of 2			
Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng
S:\23\15\Current\8\Bigmouth A84538\17-6D\Branch 17-6D Rd Design.dsn			

Prepared By:
Forsite Engineering & Geoscience Ltd.
PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366









TSL A84538
Bigmouth
Proposed Branch 17.6D
UBI - 40BK672

Level 2 Road Survey
1 - 0+000 to 54 - 0+874

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

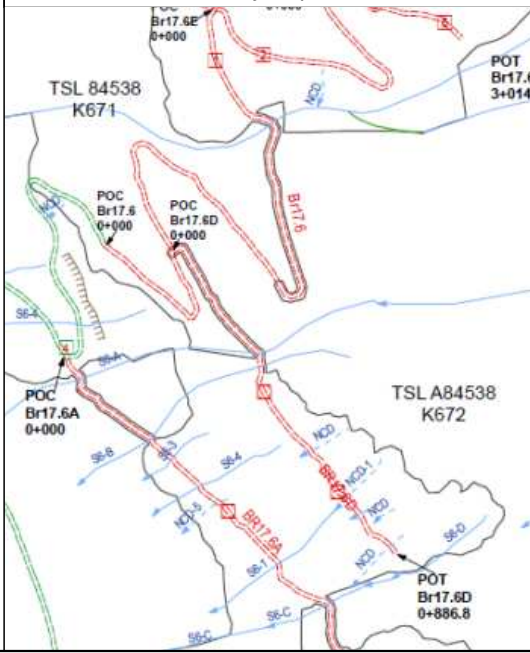
Legend

- L-Line Location
- P-line Location
- Road Edges
- Slope Stake Elevation
- Clearing Limits
- Culverts
- RT
- 2m Contours
- Proposed Road

Plan Scale 1:2000



Key Map



Culvert Summary					
Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.	
35:1	0+572.8	500	9.0	90	
44	0+705.7	500	9.0	90	
47:1	0+754.7	500	8.0	90	

Reference Point Summary					
Index	P-Stn m.	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
39	0+638.0	0+627.7	87.0°	22.0	RT 3
42	0+693.9	0+682.6	43.0°	26.0	RT 4
54	0+887.5	0+873.6	56.0°	22.0	RT 5

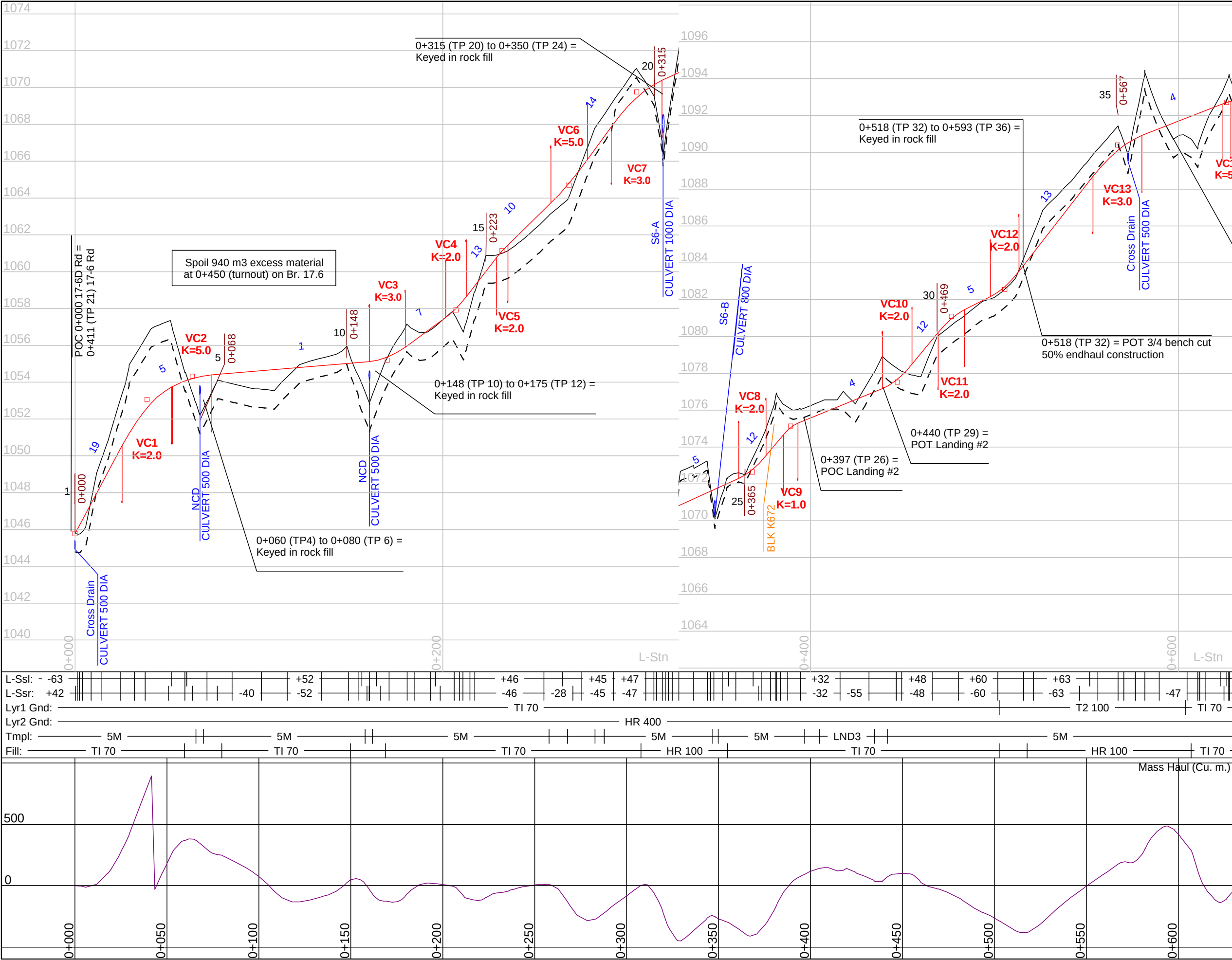
Page 2 of 2

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

S:\23\15\Current\8\Bigmouth A84538\17-6D\Branch 17-6D Rd Design.dsn

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Salmon Arm, BC
V1E 4R1
250-832-3366





TSL A84538
Bigmouth
Proposed Branch 17.6D
UBI - 40BK672

Level 2 Road Survey
1 - 0+000 to 54 - 0+874

Design Template Key				
Template ID	Description			
5M	5 meter road			
TO	Turnout template			
TP	Taper template			
W	Waste template			
LDG	Landing template			
Soils				
Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width	
T1 Till	70%	70%	0.5m X 0.3m	
T2 Till - steep cut	100%	70%	0.5m X 0.3m	
HR Hard Rock	400%	100%	0.5m X 0.3m	
Earthworks Summary				
L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+000.0	1273.7	112.2	156.1	0.0
0+050.0	308.8	414.7	158.0	181.5
0+100.0	368.2	394.8	180.9	75.6
0+150.0	498.9	538.9	223.7	49.0
0+200.0	488.2	490.3	256.3	9.0
0+250.0	418.6	508.7	194.4	6.9
0+300.0	384.9	569.9	148.0	-83.2
0+350.0	690.3	304.5	191.1	-268.2
0+400.0	1425.5	1443.3	339.3	117.6
0+450.0	329.7	692.4	157.9	99.8
0+500.0	493.1	233.9	147.8	-262.9
0+550.0	597.3	173.5	140.1	-3.8
0+600.0				420.1
Pg. Tot.	7277.2	5877.1	2293.6	
Cum. Tot.	7277.2	5877.1	2293.6	

Legend

Ground Topography

Profile Subgrade

Culverts

Gnd layer 1

Index Station

Vertical Scale 1:200
Horizontal Scale 1:2000

Page 1 of 2

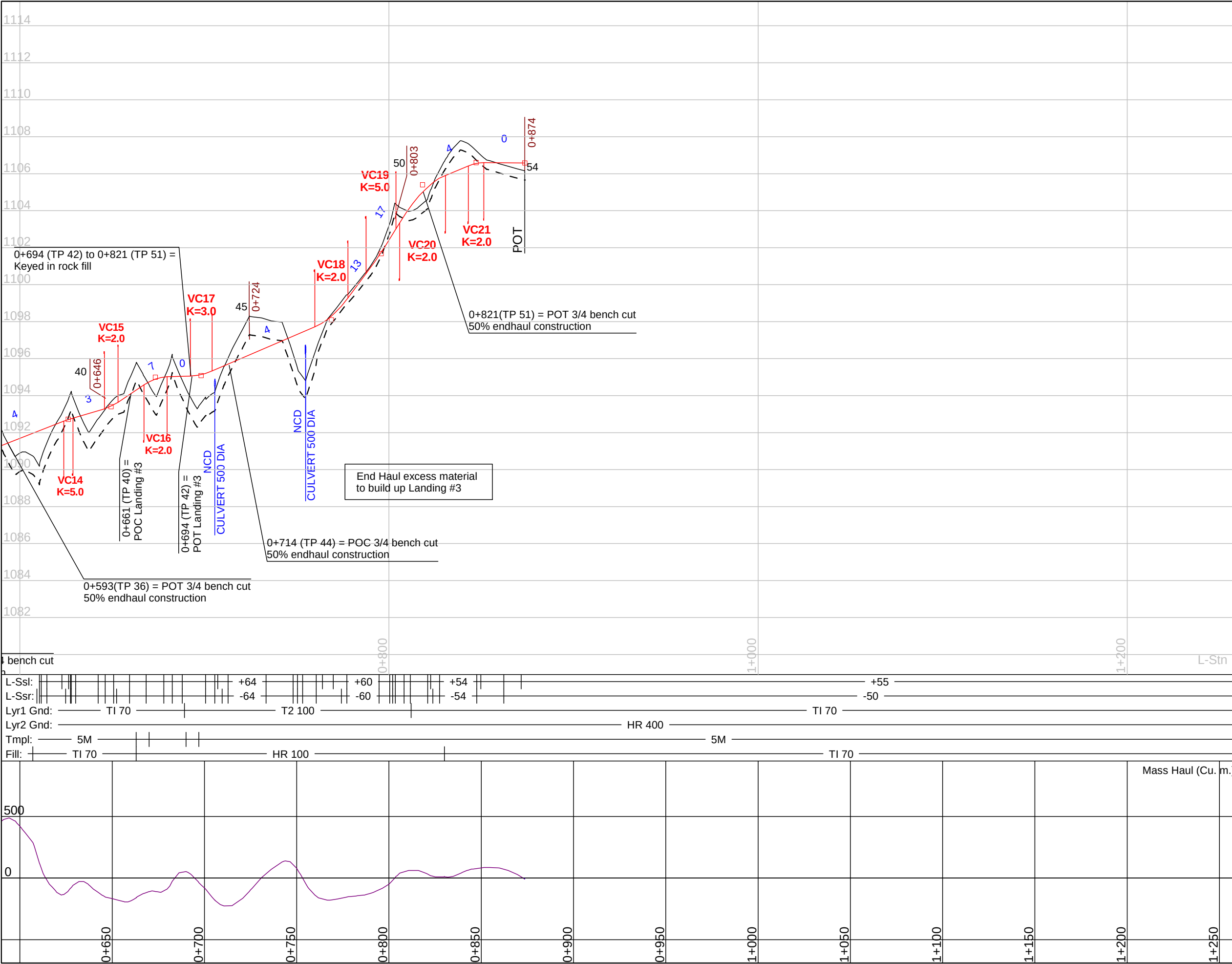
Design Date09/04/09Design ByBrett Barnard, FIT

Plotting Date09/05/13Checked ByMichael Foster, P.Eng

S:\23\15\Current\8\Bigmouth A84538\17-6D\Branch 17-6D Rd Design.dsn

Prepared By:
Forsite Engineering & Geoscience Ltd.
PO Box 1012
Salmon Arm, BC
V1E 4R1
250-832-3366







BCTS

BC Timber Sales

Okanagan - Columbia

TSL A84538
Bigmouth
Proposed Branch 17.6D
UBI - 40BK672

Level 2 Road Survey
1 - 0+000 to 54 - 0+874

Design Template Key	
Template ID	Description
5M	5 meter road
TO	Turnout template
TP	Taper template
W	Waste template
LDG	Landing template

Soils			
Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width
T1 Till	70%	70%	0.5m X 0.3m
T2 Till - steep cut	100%	70%	0.5m X 0.3m
HR Hard Rock	400%	100%	0.5m X 0.3m

Earthworks Summary				
L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+600.0		985.3	255.2	420.1
0+650.0	396.8	772.2	270.6	-168.4
0+700.0	860.8	296.0	134.9	-79.8
0+750.0	455.7	423.1	139.5	79.9
0+800.0	294.7	312.7	174.7	-48.6
0+850.0	443.9	172.0	77.7	82.6
0+873.6	82.3			-7.1
Pg. Tot.	2534.1	2961.3	1052.7	
Cum. Tot.	9811.3	8838.4	3346.3	

Legend

Ground Topography

Profile Subgrade

Culverts

Gnd layer 1

10

Index Station

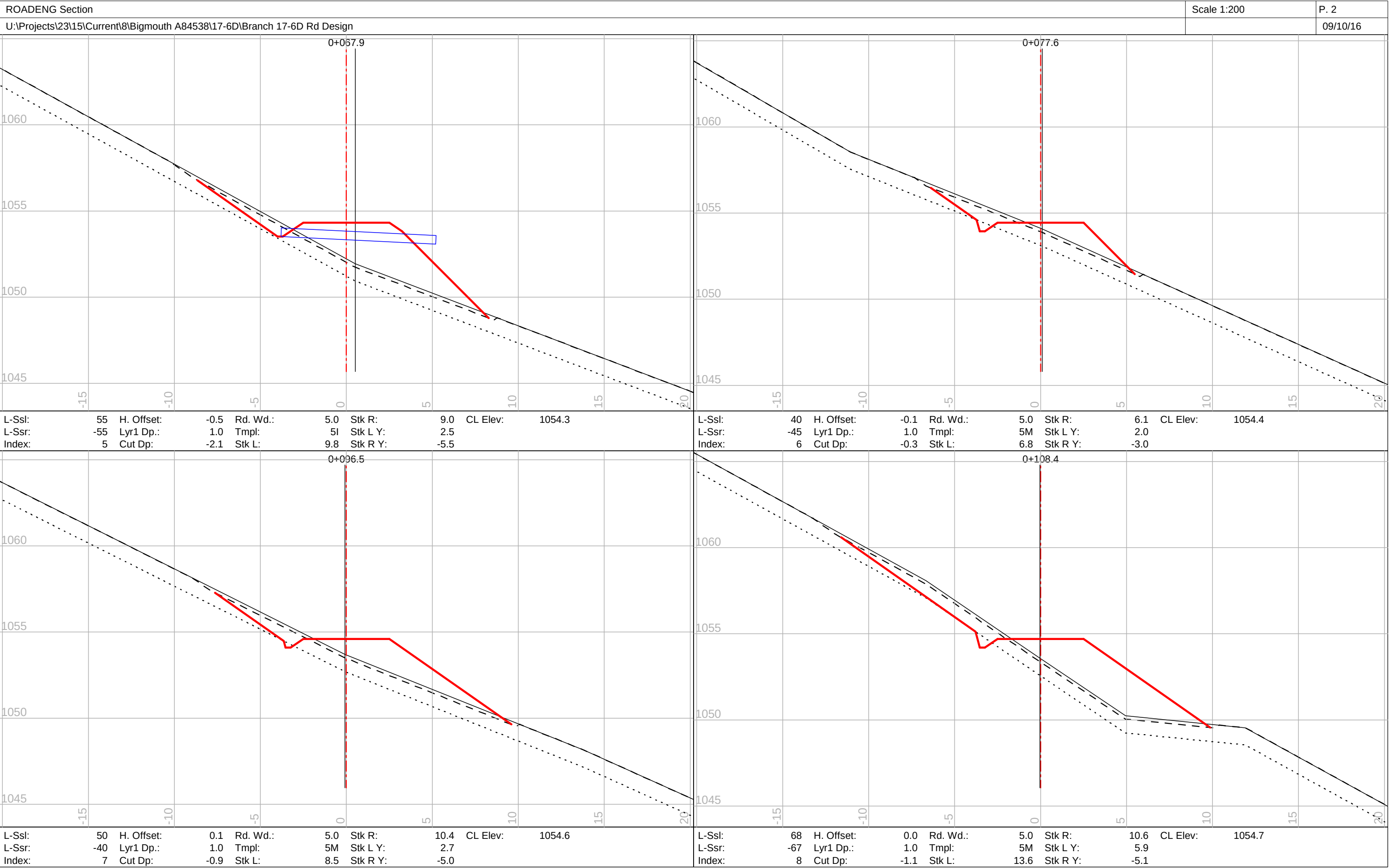
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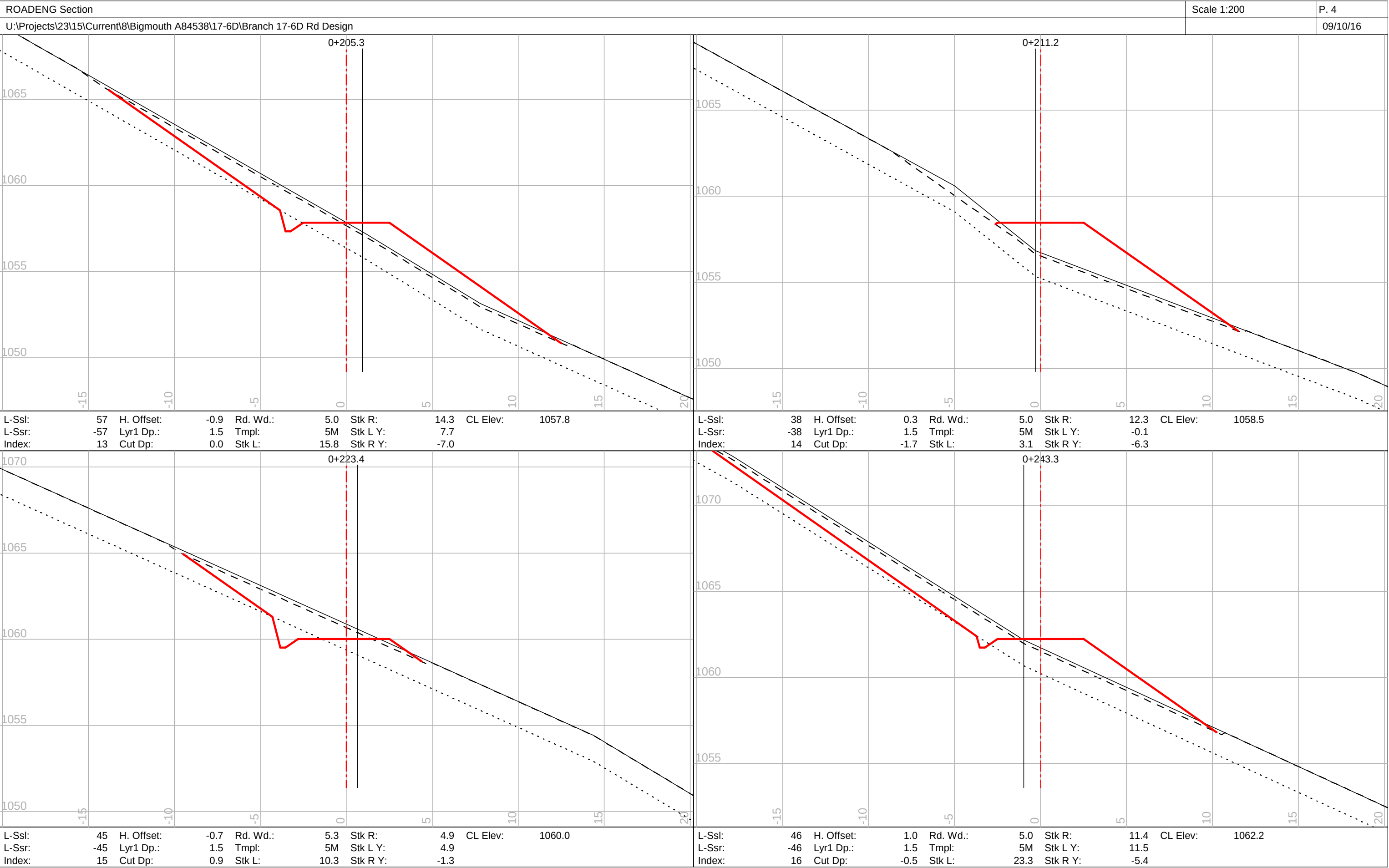
Page 2 of 2			
Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng
S:\23\15\Current\8\Bigmouth A84538\17-6D\Branch 17-6D Rd Design.dsn			

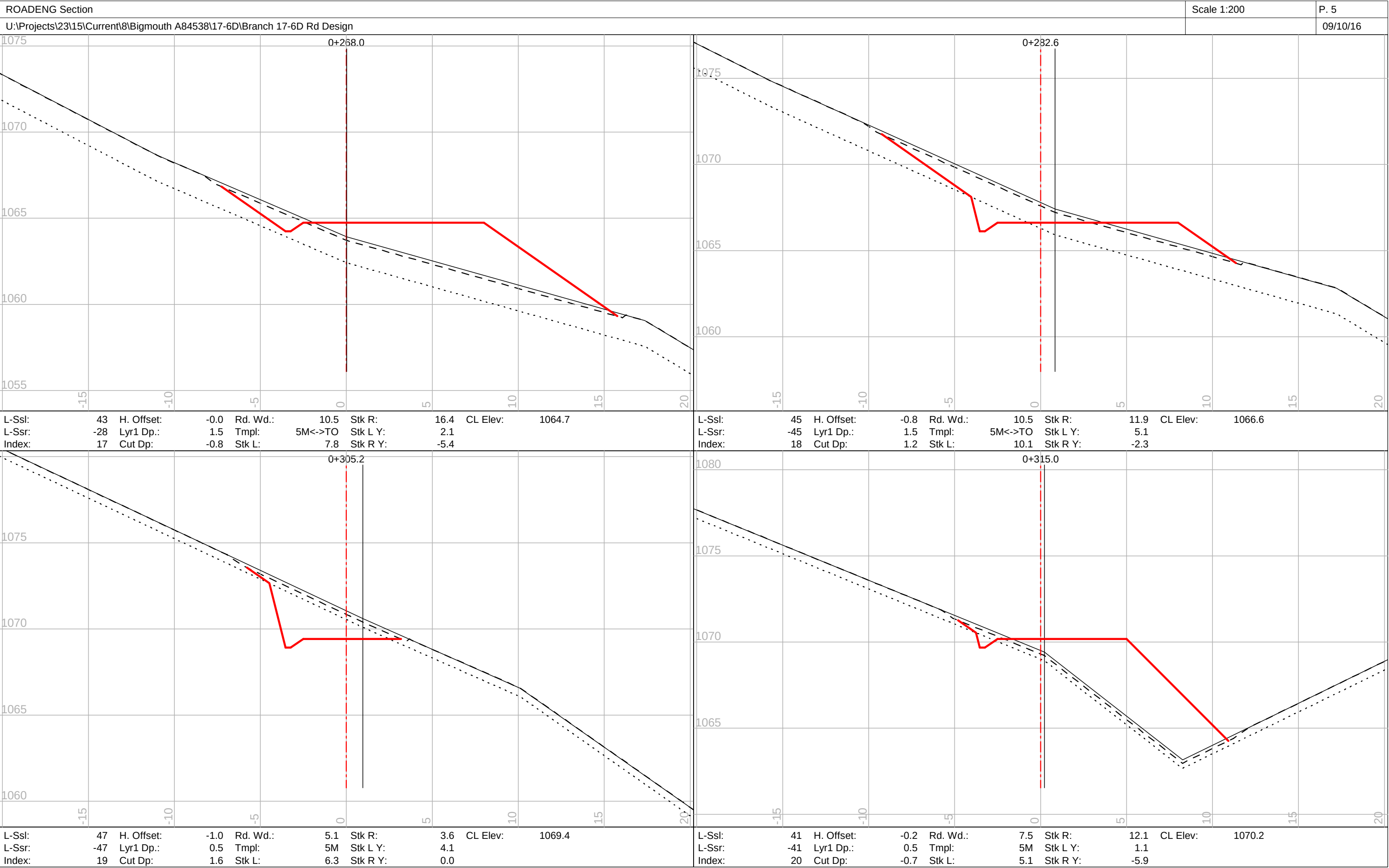
Prepared By:
Forsite Engineering & Geoscience Ltd.
PO Box 1012
Salmon Arm, BC
V1E 4R1
250-832-3366

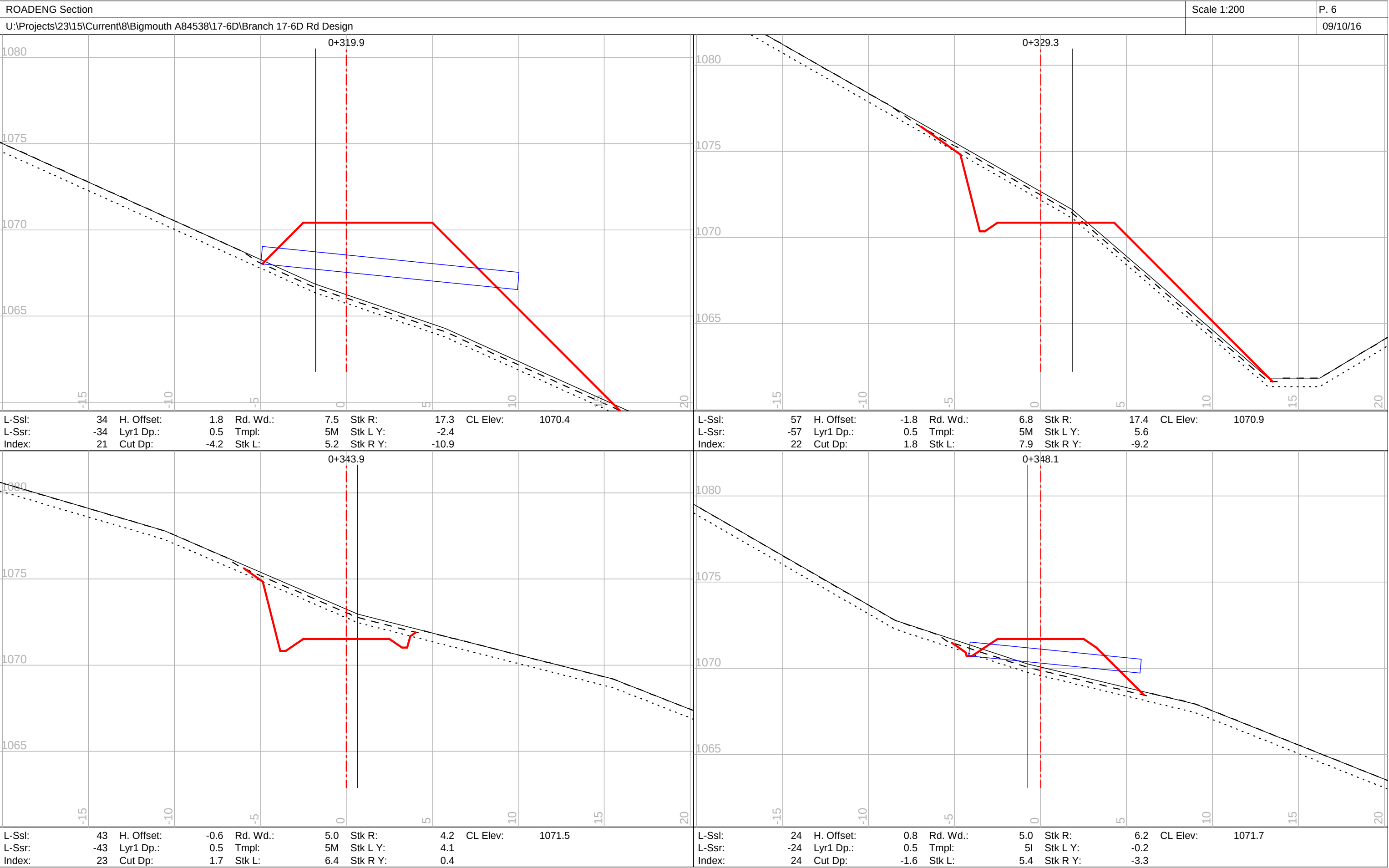


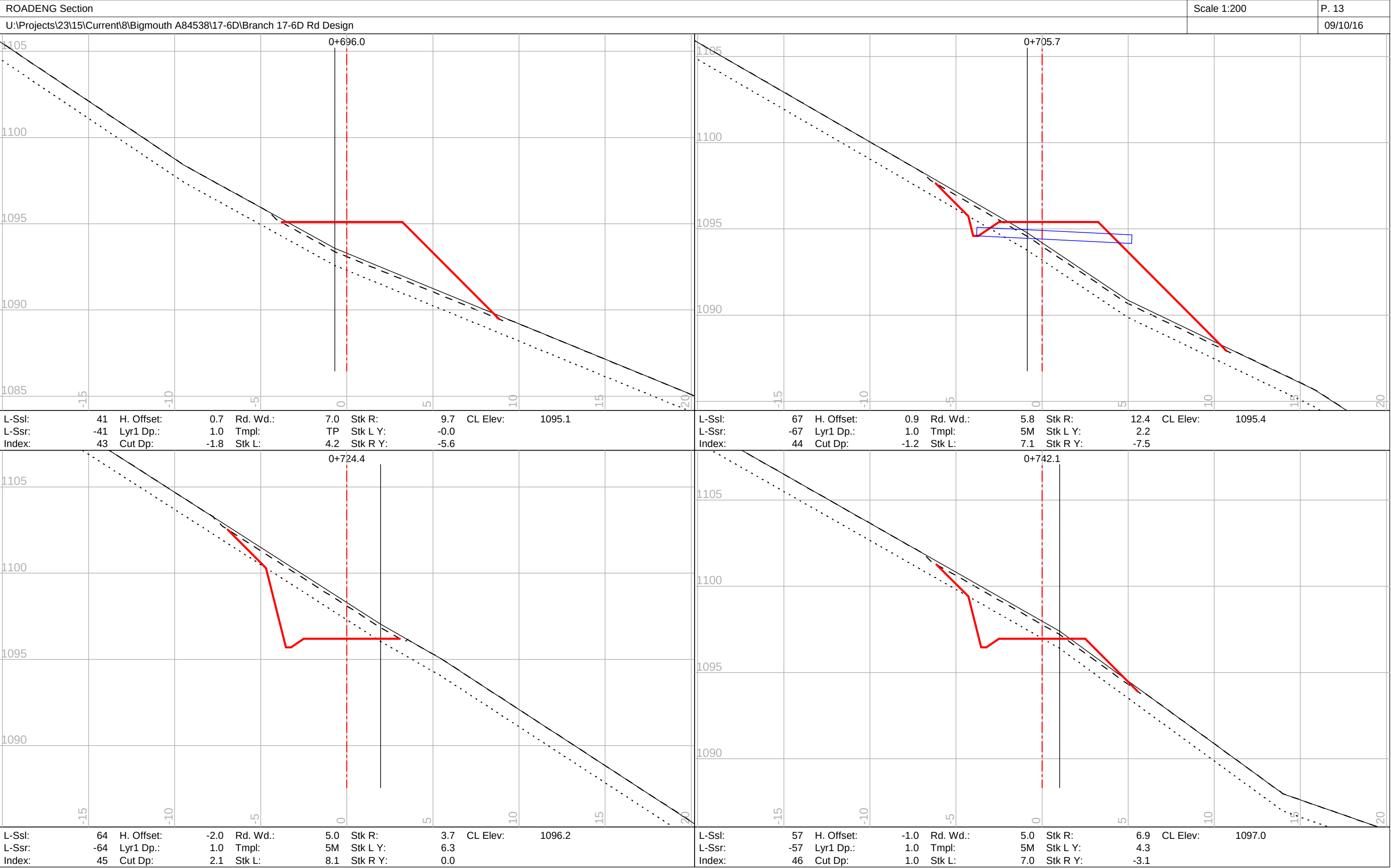
ROAD CROSS-SECTIONS

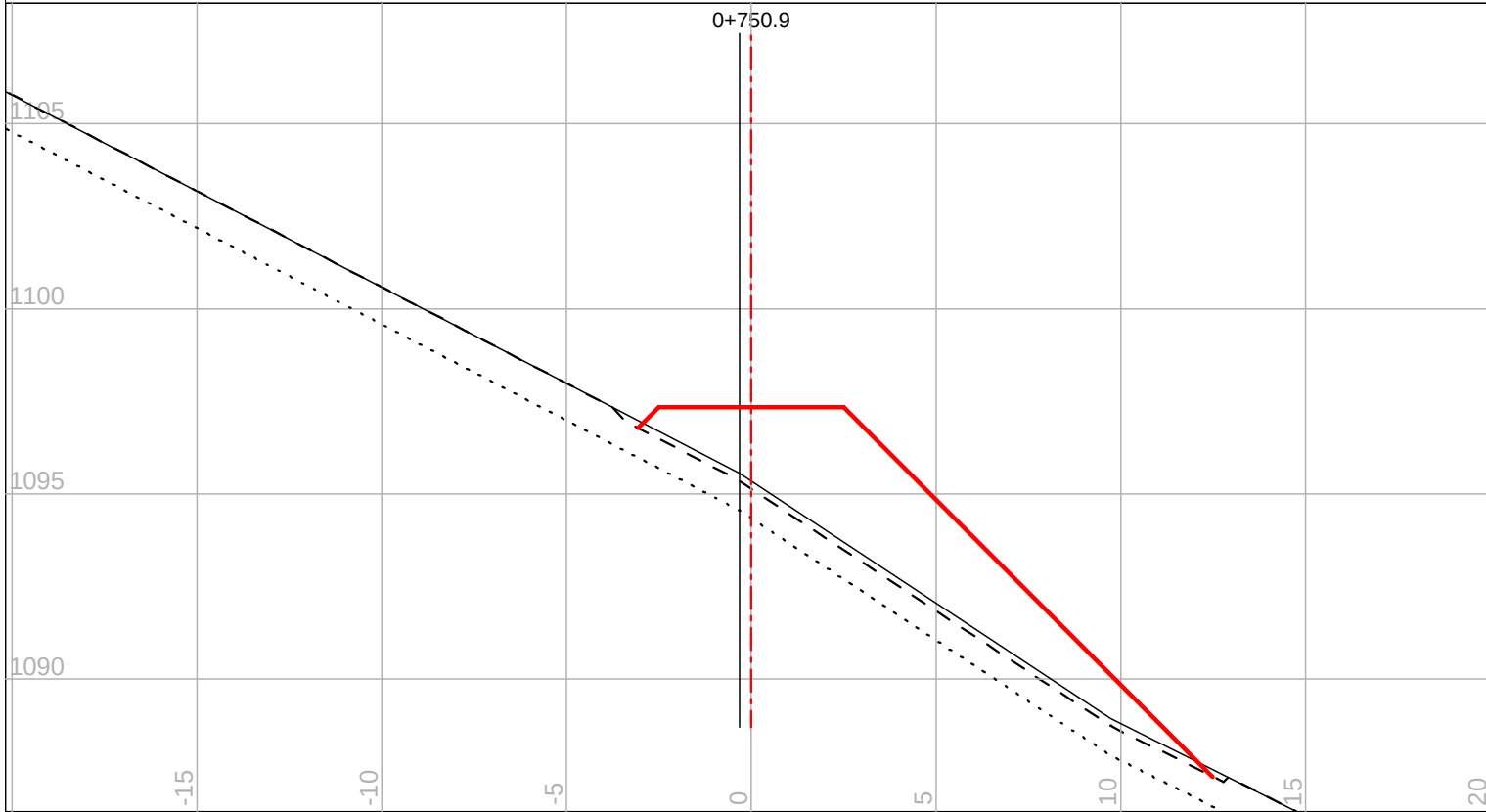




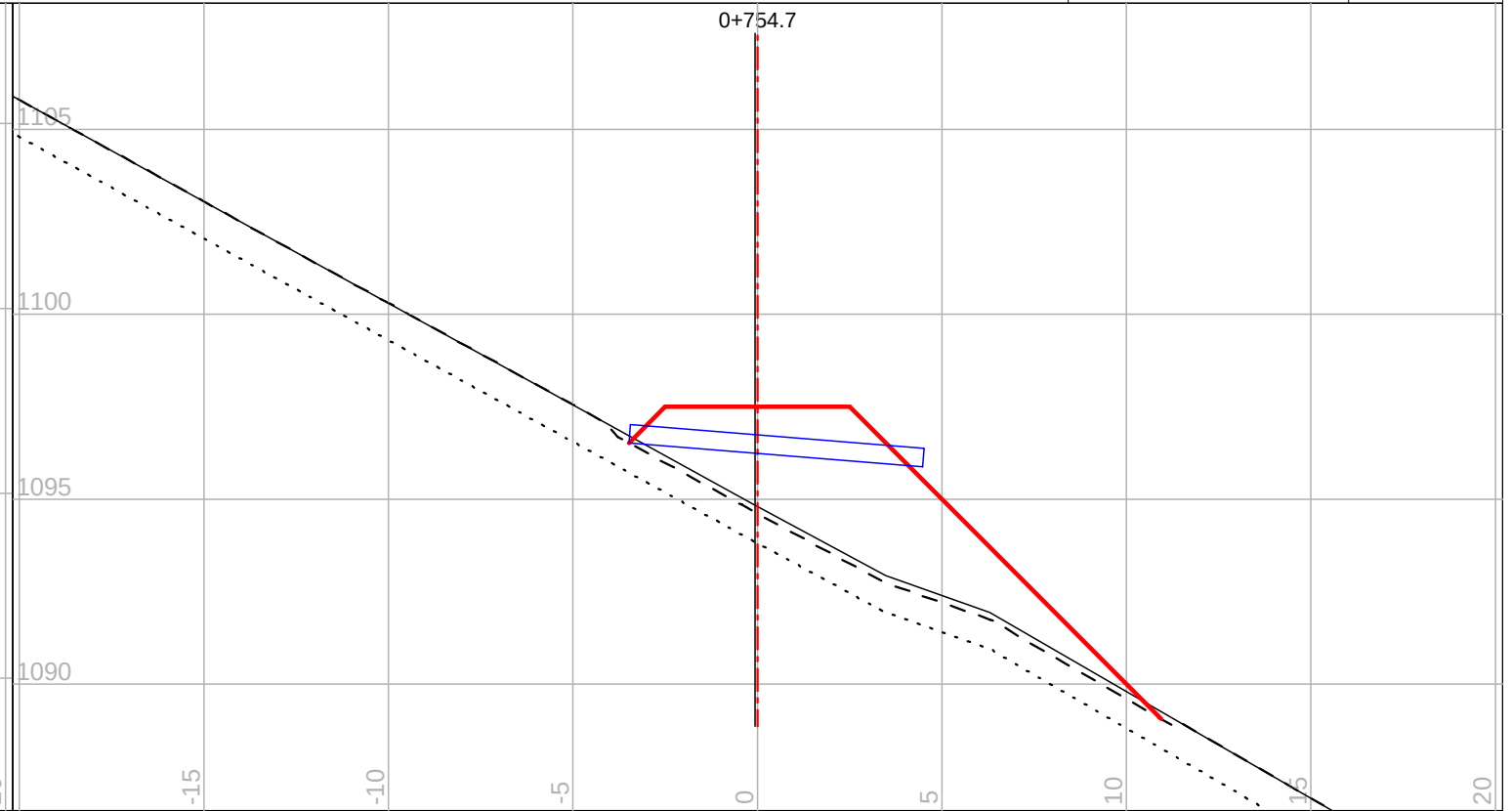




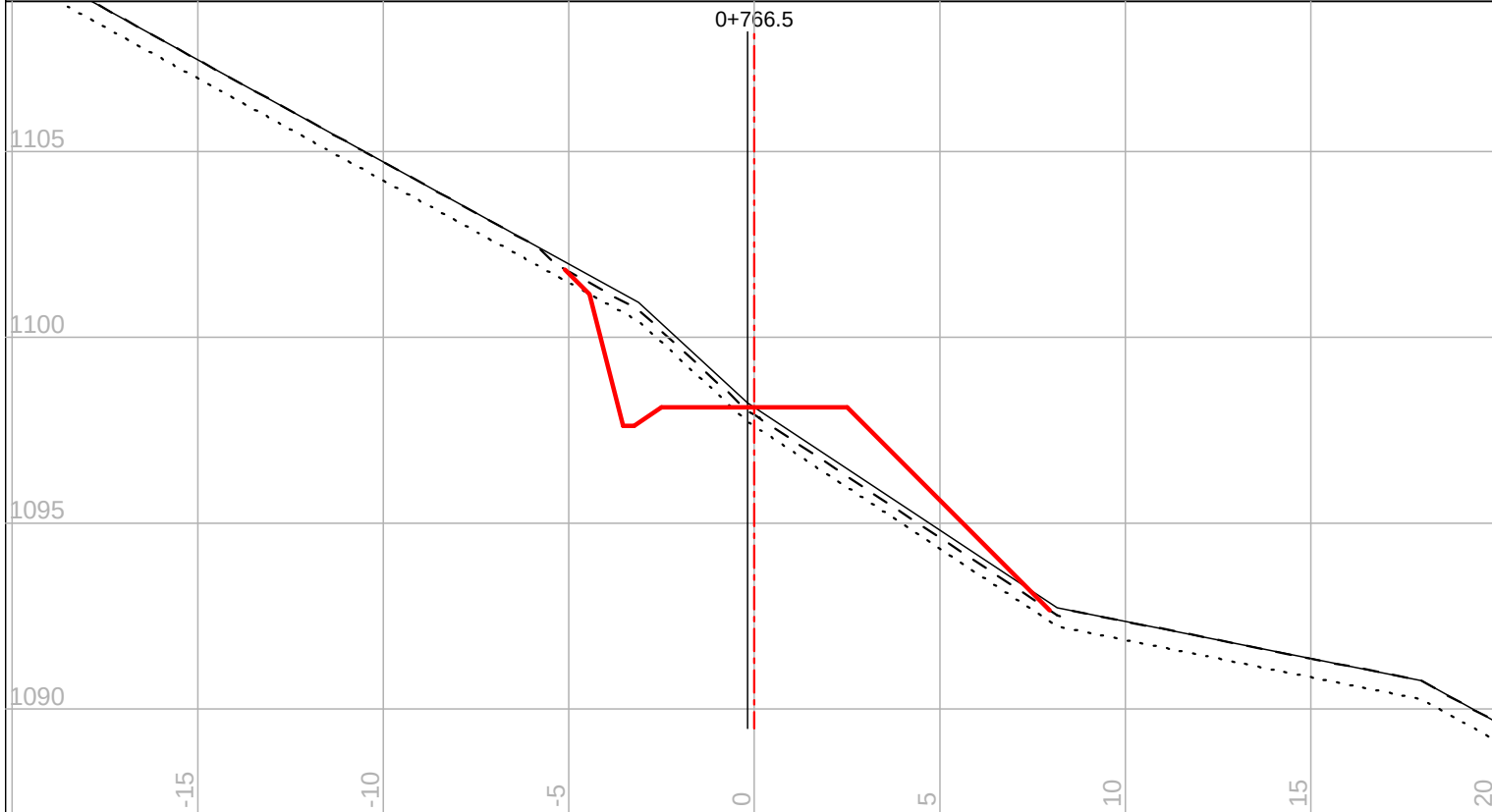




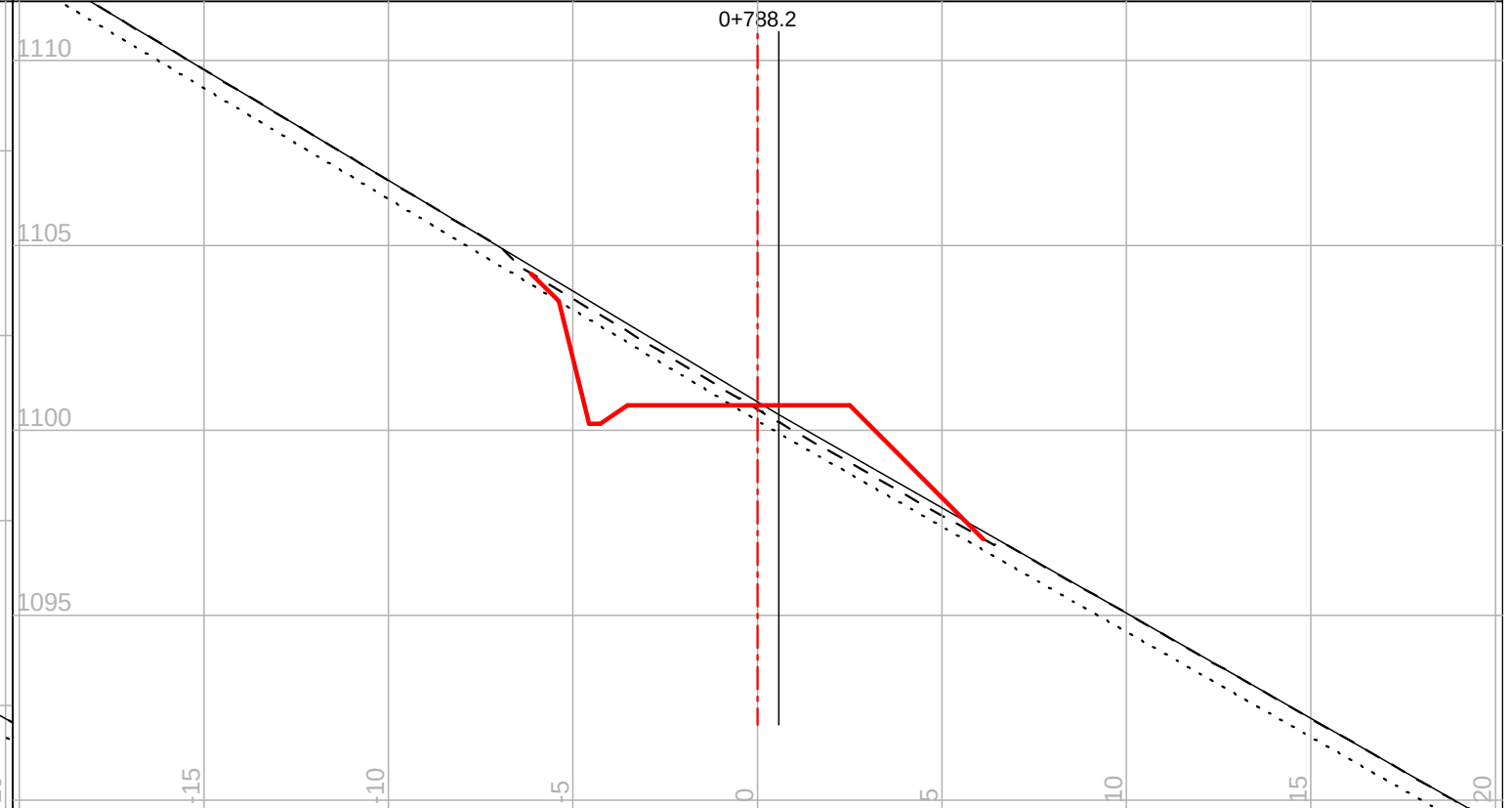
L-Ssl:	66	H. Offset:	0.3	Rd. Wd.:	5.0	Stk R:	14.8	CL Elev:	1097.3
L-Ssr:	-66	Lyr1 Dp.:	1.0	Tmpl:	5M	Stk L Y:	-0.6		
Index:	47	Cut Dp:	-2.0	Stk L:	3.4	Stk R Y:	-10.0		



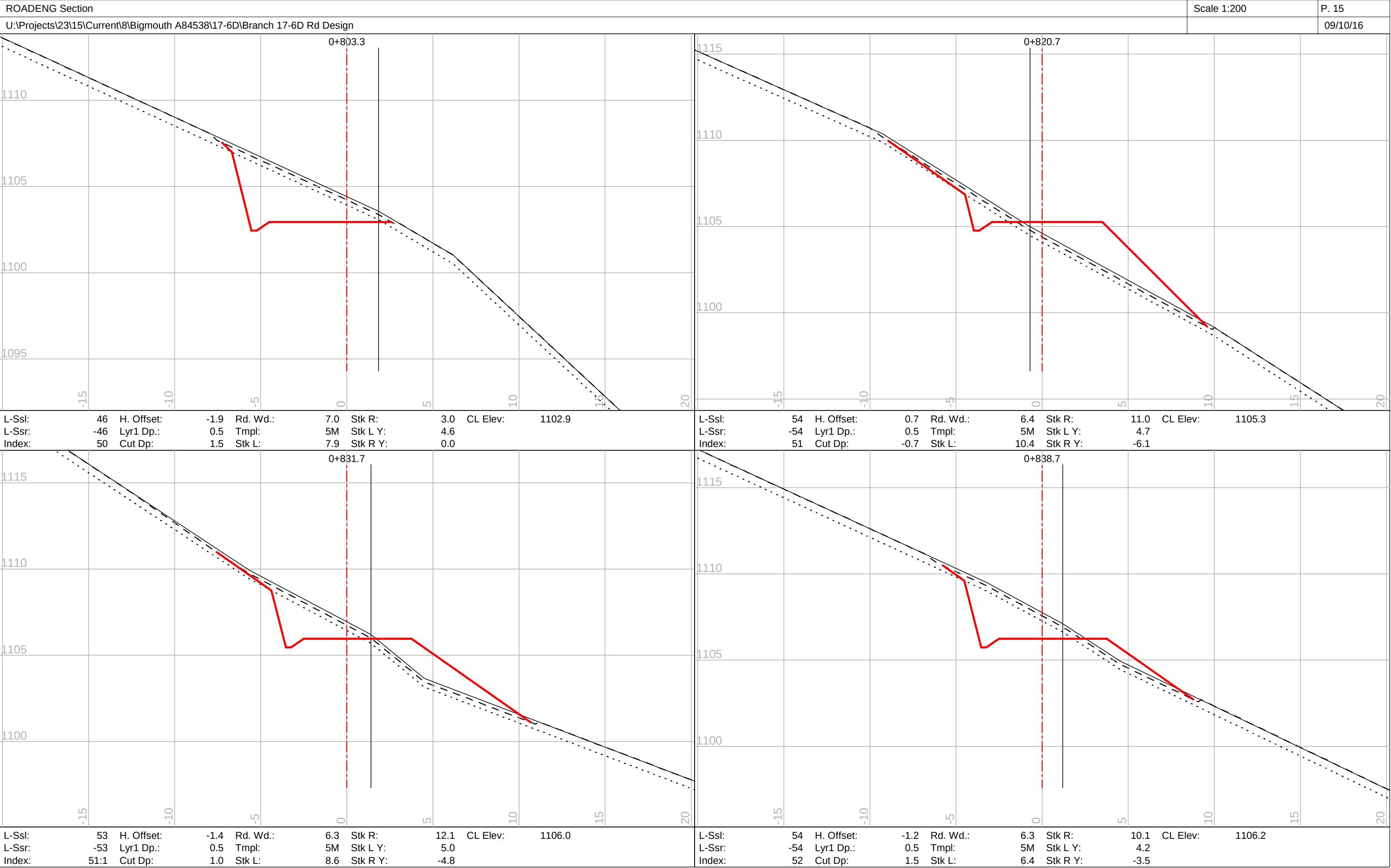
L-Ssl:	55	H. Offset:	0.1	Rd. Wd.:	5.0	Stk R:	12.3	CL Elev:	1097.5
L-Ssr:	-54	Lyr1 Dp.:	1.0	Tmpl:	5M	Stk L Y:	-1.0		
Index:	47:1	Cut Dp:	-2.7	Stk L:	3.9	Stk R Y:	-8.4		

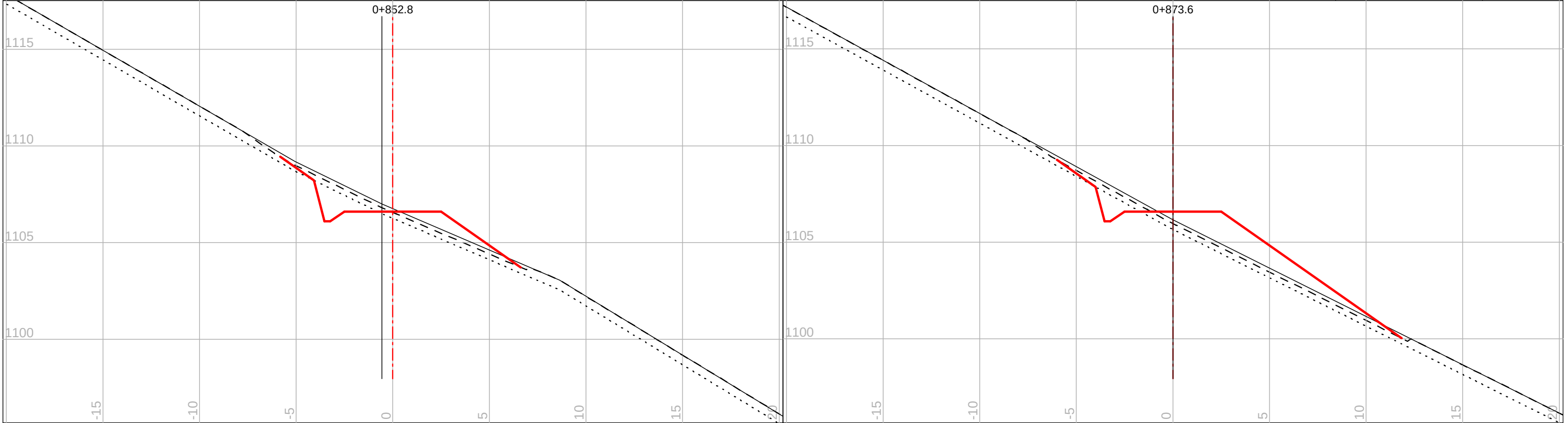


L-Ssl:	66	H. Offset:	0.2	Rd. Wd.:	5.0	Stk R:	9.6	CL Elev:	1098.1
L-Ssr:	-66	Lyr1 Dp.:	0.5	Tmpl:	5M	Stk L Y:	3.7		
Index:	48	Cut Dp:	-0.0	Stk L:	6.3	Stk R Y:	-5.5		



L-Ssl:	60	H. Offset:	-0.6	Rd. Wd.:	6.0	Stk R:	7.1	CL Elev:	1100.7
L-Ssr:	-60	Lyr1 Dp.:	0.5	Tmpl:	5M	Stk L Y:	3.6		
Index:	49	Cut Dp:	0.1	Stk L:	7.1	Stk R Y:	-3.6		





L-Ssl:	43	H. Offset:	0.6	Rd. Wd.:	5.0	Stk R:	7.3	CL Elev:	1106.6	L-Ssl:	55	H. Offset:	0.0	Rd. Wd.:	5.0	Stk R:	13.3	CL Elev:	1106.6
L-Ssr:	-43	Lyr1 Dp.:	0.5	Tmpl:	5M	Stk L Y:	2.8			L-Ssr:	-50	Lyr1 Dp.:	0.5	Tmpl:	5M	Stk L Y:	2.7		
Index:	53	Cut Dp:	0.2	Stk L:	6.4	Stk R Y:	-2.9			Index:	54	Cut Dp:	-0.4	Stk L:	6.7	Stk R Y:	-6.5		

TRAVERSE NOTES

Description: Branch 17.6 A
 Crew: SE/TL/PW/MJ
 Unit: Blk K671
 Survey Date: Sept 2 /08
 Length: 887.5m.
 Number of Shots: 68

Inde	Station	Typ	Fore	H.D	S.D.	Slp.	(SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	144	25.0	25.0	2.0								
12	182.8						56.0/10.0 T,50.0/..	-58.0/9.0 T,-40.0/8.0 T,-50.0/..	TI/1.50/HR			403829.7	5745250.8	1056.8
		FS	160	20.7	21.0	17.0								
11	162.1						54.0/..	-42.0/..	TI/1.50/HR	500	NCD	403822.7	5745270.1	1053.3
		FS	126	12.8	13.0	16.0								
10	149.3						48.0/..	-46.0/12.0 T,-55.0/..	TI/1.00/HR			403812.3	5745277.6	1055.4
		FS	155	26.0	26.0	2.0								
9	123.3						52.0/..	-42.0/10.0 T,-50.0/..	TI/1.00/HR			403801.4	5745301.0	1054.8
		FS	155	13.9	14.0	9.0								
8	109.4						68.0/8.0 T,55.0/..	-67.0/6.0 T,-10.0/7.0 T,-55.0/..	TI/1.00/HR			403795.5	5745313.6	1053.6
		FS	150	12.0	12.0	-1.0								
7	97.4						50.0/..	-40.0/15.0 T,-45.0/..	TI/1.00/HR			403789.6	5745323.9	1053.7
		FS	149	19.0	19.0	-2.0								
6	78.4						40.0/12.0 T,58.0/..	-45.0/..	TI/1.00/HR			403779.8	5745340.1	1054.1
		FS	147	9.8	10.0	22.0								
5	68.6						55.0/..	-38.0/..	TI/1.00/HR			403774.5	5745348.2	1051.9
		FS	155	16.1	17.0	34.0								
4	52.5						42.0/..	-70.0/7.0 T,-35.0/6.0 T,-65.0/10.0 T,-20.0/..	TI/1.00/HR			403767.7	5745362.7	1057.4
		FS	151	22.9	23.0	11.0								
3	29.6						38.0/..	-3.0/4.0 T,-55.0/8.0 T,-10.0/5.0 T,-40.0/..	TI/1.00/HR			403756.7	5745382.6	1054.9
		FS	91	12.3	13.0	33.0								
2	17.3						-1.0/..	4.0/..	TI/1.00/HR			403744.4	5745382.7	1050.8
		FS	50	17.3	18.0	29.0								
1:1	0.0:1								**		RT3	403734.0	5745394.3	1045.8
		RS	7	23.0	23.0	0.0								
1*	0.0						-70.0/6.0 T,-15.0/6.0 T,-55.0/..	47.0/8.0 T,45.0/..	TI/1.00/HR		Jct Br 17.6 sta 21	* 403731.2	* 5745371.5	1045.8

Inde	Station	Typ	Fore	H.D	S.D.	Slp.	(SSL Slp.)/S.D.	SSR Slp.)/S.D.	GND	CRK	Label	X	Y	Z
		FS	200	17.7	18.0	17.0								
25	369.7						72.0/15.0 T,30.0/..	-51.0/10.0 T,-75.0/6.0 T,30.0/..	TI/0.50/HR			403928.1	5745104.3	1072.8
		FS	181	16.8	17.0	15.0								
24:1	359.6						52.0/..	-72.0/8.0 T,50.0/2.0 T,-45.0/..	TI/0.50/HR			403928.3	5745114.4	1072.4
		IFS	181	6.7	7.0	32.0								
24	352.9						33.0/8.0 T,58.0/..	-24.0/10.0 T,-40.0/..	TI/0.50/HR	600	Str 'B'	403928.4	5745121.0	1070.3
		FS	156	4.2	5.0	64.0								
23	348.7						44.0/12.0 T,30.0/..	-26.0/15.0 T,-40.0/..	TI/0.50/HR			403926.7	5745124.8	1073.0
		FS	171	14.9	15.0	9.0								
22	333.8						57.0/..	-86.0/15.0 T,0.0/3.0 T,60.0/..	TI/0.50/HR			403924.4	5745139.5	1071.6
		FS	185	9.9	11.0	48.0								
21	323.9						45.0/..	-34.0/8.0 T,-45.0/..	TI/0.50/HR	1000	Str 'A'	403925.3	5745149.3	1066.9
		FS	126	5.4	6.0	47.0								
20	318.4						42.0/..	-80.0/10.0 T,50.0/..	TI/0.50/HR			403920.9	5745152.5	1069.4
		FS	131	9.9	10.0	12.0								
19:1	08.5:1								**		RT 1	403933.4	5745160.7	1070.6
		RS	85	20.0	20.0	0.0								
19	308.5						47.0/..	-44.0/10.0 T,-70.0/..	TI/0.50/HR		Timber edge	403913.5	5745158.9	1070.6
		FS	134	22.8	23.0	14.0								
18	285.7						45.0/18.0 T,50.0/..	-28.0/17.0 T,-60.0/..	TI/1.50/HR			403897.1	5745174.6	1067.4
		FS	137	14.6	15.0	24.0								
17	271.1						43.0/12.0 T,52.0/..	-28.0/18.0 T,-60.0/..	TI/1.50/HR			403887.2	5745185.2	1063.9
		FS	136	24.9	25.0	7.0								
16	246.2						63.0/20.0 T,55.0/..	-46.0/25.0 T,-55.0/..	TI/1.50/HR			403870.0	5745203.0	1062.2
		FS	133	19.9	20.0	8.0								
15	226.3						45.0/..	-45.0/15.0 T,-60.0/..	TI/1.50/HR			403855.4	5745216.5	1060.6
		FS	149	12.5	13.0	30.0								
14	213.8						80.0/6.0 T,55.0/..	-38.0/20.0 T,-45.0/..	TI/1.50/HR			403849.0	5745227.1	1056.8
		FS	128	6.0	6.0	-8.0								
13	207.8						57.0/..	-61.0/8.0 T,-45.0/15.0 T,-50.0/..	TI/1.50/HR			403844.3	5745230.7	1057.3

Inde	Station	Typ	Fore	H.D	S.D.	Slp.(	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS	138	14.0	14.0	0.0								
37	606.2						59.0/..	-47.0/6.0 T,-65.0/..	T2/1.00/HR		pot full bench	404054.5	5744919.3	1091.2
		FS	122	15.8	16.0	14.0								
36	590.4						54.0/..	-65.0/..	T2/1.00/HR			404041.1	5744927.6	1093.4
		FS	150	14.9	15.0	9.0								
35:1	580.9						60.0/..	-52.0/..	T2/1.00/HR	500	[N]str 6 sta 6 = NCD	404036.4	5744935.8	1089.6
		IFS	150	5.5	6.0	46.0								
35	575.5						68.0/10.0 T,57.0/..	-74.0/15.0 T,-45.0/..	T2/1.00/HR			404033.7	5744940.5	1092.1
		FS	131	25.7	26.0	15.0								
34	549.7						63.0/..	-65.0/4.0 T,-67.0/..	T2/1.00/HR			404014.3	5744957.2	1088.2
		FS	129	15.8	16.0	15.0								
33	533.9						62.0/8.0 T,55.0/..	-65.0/..	T2/1.00/HR		poc full bench	404002.1	5744967.0	1085.8
		FS	143	14.8	15.0	15.0								
32	519.1						65.0/..	-58.0/10.0 T,-50.0/..	T2/1.00/HR			403993.2	5744978.8	1083.6
		FS	140	18.0	18.0	6.0								
31	501.1						65.0/6.0 T,55.0/..	-60.0/6.0 T,-55.0/..	TI/1.00/HR			403981.7	5744992.5	1082.5
		FS	143	24.9	25.0	9.0								
30	476.2						51.0/10.0 T,74.0/..	-55.0/..	TI/1.00/HR			403966.8	5745012.2	1080.3
		FS	144	29.9	30.0	6.0								
29:1	467.3						55.0/6.0 T,65.0/..	-48.0/..	TI/1.00/HR			403961.5	5745019.4	1078.1
		IFS	144	21.0	21.0	-2.0								
29	446.3						45.0/..	-60.0/10.0 T,-40.0/..	TI/1.00/HR			403949.2	5745036.3	1078.5
		FS	157	14.8	15.0	17.0								
28	431.5						55.0/..	-35.0/12.0 T,-45.0/..	TI/1.00/HR			403943.5	5745049.8	1076.0
		FS	145	17.0	17.0	1.0								
27:1	14.5:1								TI/0.50/HR		RT 2	403954.5	5745066.9	1075.8
		RS	81	21.0	21.0	0.0								
27	414.5						32.0/12.0 T,52.0/..	-32.0/10.0 T,-50.0/..	TI/0.50/HR		Ldg 2	403933.8	5745063.6	1075.8
		FS	154	27.0	27.0	0.0								
26	387.5						46.0/10.0 T,34.0/..	-60.0/..	TI/0.50/HR		Bdy blk K672	403922.0	5745087.7	1075.8

Inde	Station	Typ	Fore	H.D	S.D.	Slp.(	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		IFS	150	3.9	4.0	18.0								
47	763.4						52.0/..	-66.0/12.0 T,-50.0/..	T2/1.00/HR		pot full bench	404143.9	5744798.3	1095.5
		FS	134	8.8	9.0	21.0								
46	754.6						57.0/..	-73.0/16.0 T,-35.0/..	T2/1.00/HR			404137.6	5744804.4	1097.4
		FS	138	18.0	18.0	2.0								
45	736.6						64.0/..	-57.0/4.0 T,-65.0/..	T2/1.00/HR		poc full bench	404125.6	5744817.7	1097.0
		FS	147	18.9	19.0	12.0								
44	717.7						58.0/..	-67.0/7.0 T,-48.0/12.0 T,-65.0/..	T2/1.00/HR	500	[N]str 1 ncd	404115.4	5744833.4	1094.8
		FS	124	9.9	10.0	12.0								
43	707.8						55.0/10.0 T,67.0/..	-41.0/..	T2/1.00/HR			404107.2	5744838.9	1093.6
		FS	117	13.9	14.0	14.0								
42:1	93.9:1								T2/1.00/HR		RT 4	404112.6	5744864.1	1095.5
		RS	43	26.0	26.0	0.0								
42	693.9						37.0/5.0 T,54.0/..	-28.0/4.0 T,-58.0/7.0 T,-65.0/..	TI/1.00/HR		Ldg 3 - 25x25	404094.8	5744845.1	1095.5
		FS	154	20.0	20.0	-1.0								
41:1	684.8						63.0/..	-55.0/2.0 T,-45.0/..	TI/1.00/HR			404090.8	5744853.3	1093.8
		IFS	154	10.8	11.0	18.0								
41	673.9						33.0/4.0 T,55.0/..	-52.0/4.0 T,-60.0/..	TI/1.00/HR			404086.1	5744862.9	1095.7
		FS	152	16.9	17.0	11.0								
40:1	667.0						57.0/..	-50.0/5.0 T,-60.0/..	TI/1.00/HR			404082.9	5744869.0	1093.9
		IFS	152	10.0	10.0	0.0								
40	657.0						58.0/..	-65.0/4.0 T,-42.0/7.0 T,-60.0/..	TI/1.00/HR			404078.2	5744877.8	1093.9
		FS	136	19.0	19.0	0.0								
39:2	647.9						72.0/12.0 T,30.0/..	-54.0/..	TI/1.00/HR			404071.9	5744884.2	1092.5
		IFS	136	9.9	10.0	14.0								
39:1	38.0:1								TI/1.00/HR		RT 3	404087.0	5744892.5	1093.9
		RS	87	22.0	22.0	0.0								
39	638.0						37.0/8.0 T,55.0/..	-55.0/..	TI/1.00/HR			404065.1	5744891.3	1093.9
		FS	176	17.8	18.0	15.0								
38	620.2						62.0/..	-55.0/3.0 T,-42.0/..	TI/1.00/HR		draw	404063.9	5744909.0	1091.2

[illegible]

CULVERT SUMMARY

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
1	0+000.0	500	14	135
5	0+067.9	500	9	90
11	0+160.1	500	10	90
21	0+319.9	1000	15	90
24	0+348.1	800	10	90
35:1	0+572.8	500	9	90
44	0+705.7	500	9	90
47:1	0+754.7	500	8	90

Totals

# of Culver	Dia (mm)	Length (m)
6	500	69
1	800	10
1	1000	15

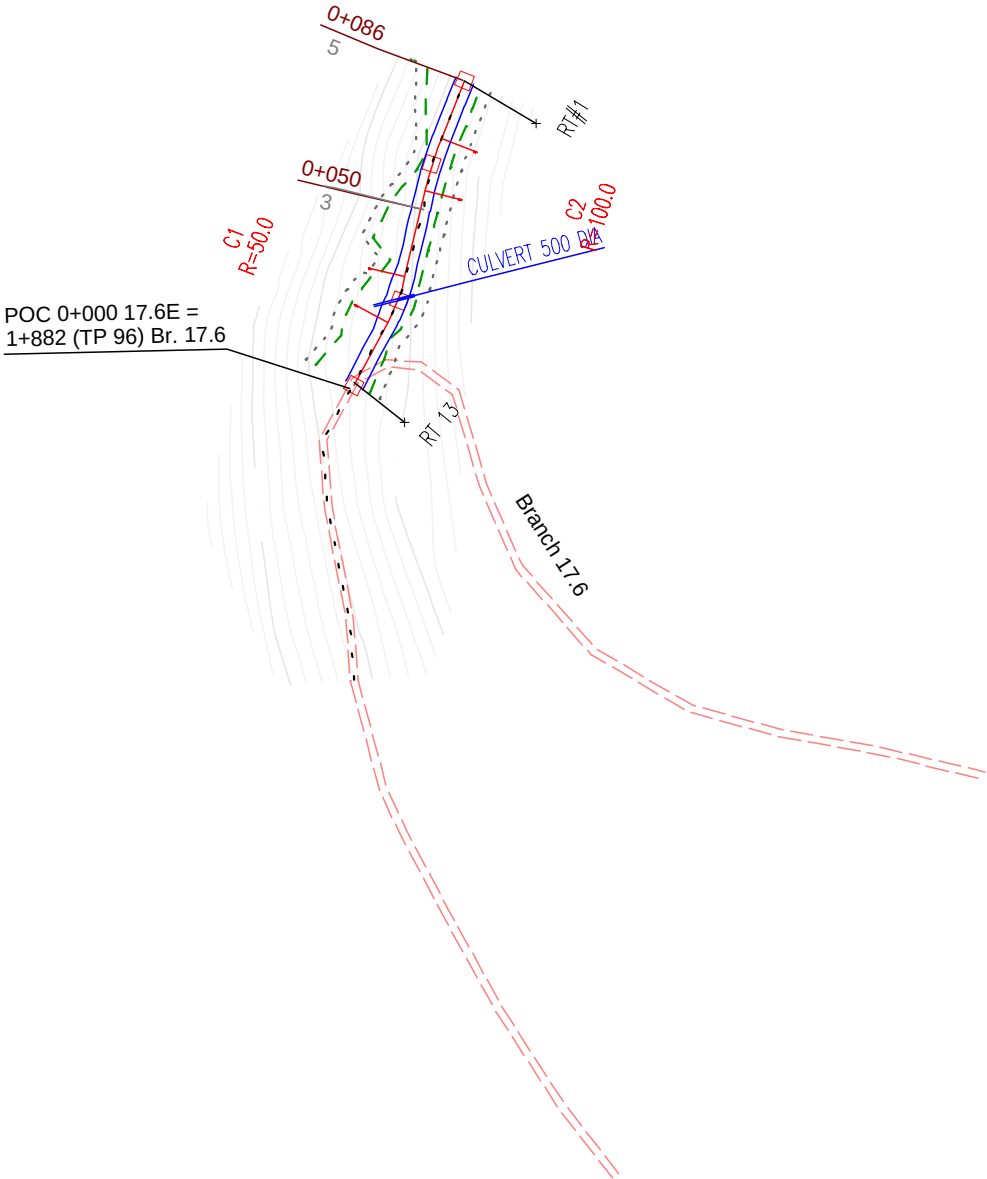
APPENDIX 4

Branch 17.6E

Level 2 Geometric Road Design

Bigmouth 17.6E Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+001	1	TI	HR		-2.8	17	507	-25
0+025	2	TI	HR		-0.5	138	114	-511
0+050	3	TI	HR		0.9	155	10	-474
0+063	4	TI	HR		2.2	261	40	-294
0+086	5	TI	HR		0.0			-19

PLAN AND PROFILE SHEETS

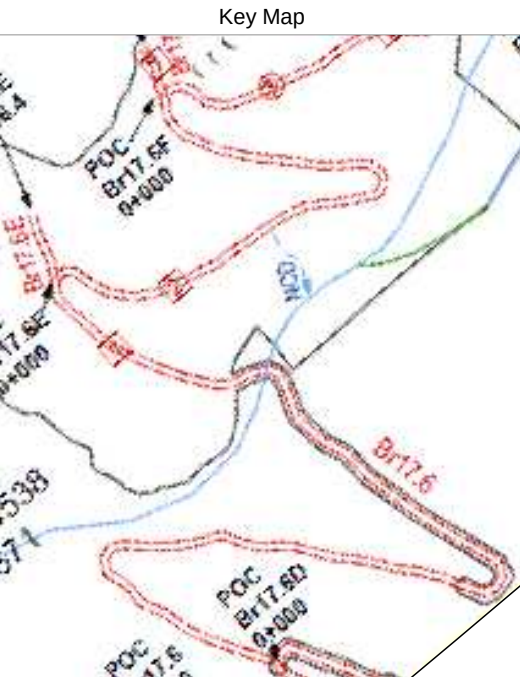


Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

- Legend
- L-Line Location
 - P-line Location
 - Road Edges
 - Slope Stake Elevation
 - Clearing Limits
 - Culverts
 - RT
 - 2m Contours
 - Proposed Road

Plan Scale 1:2000



TSL A84538
Bigmouth
Proposed Branch 17.6E
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 5 - 0+86

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

Culvert Summary

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
2	0+025.4	500	11.0	55

Reference Point Summary

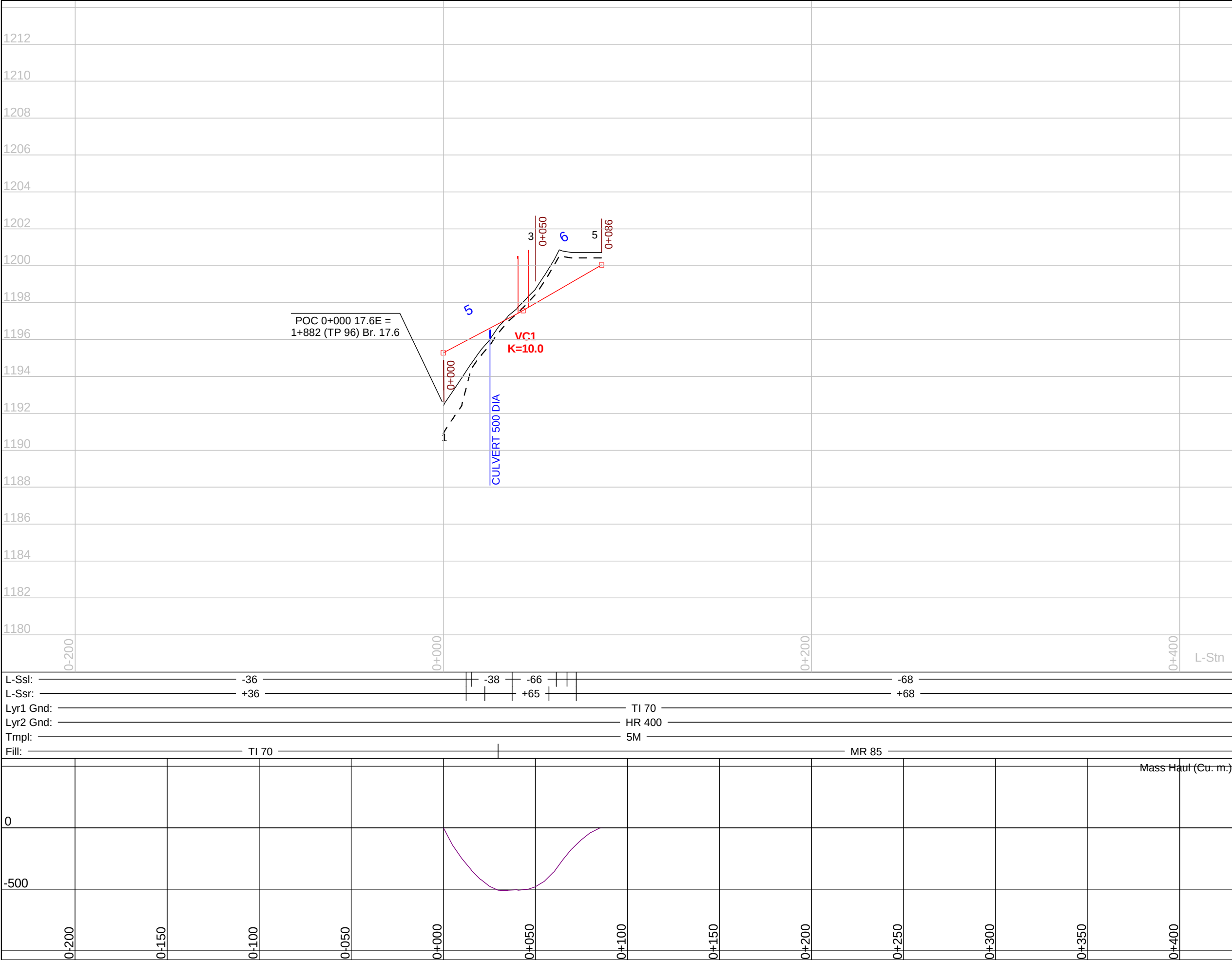
Index	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
1	0+000.7	130.0°	17.0	RT 13
5	0+086.1	122.0°	22.0	RT#1

Page 1 of 1

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng
S:\23\15\Current\8\Bigmouth A84538\Br 17-6E\17-6E Rd design.dsn			

Prepared By:
Forsite Engineering & Geoscience Ltd.
PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366







BCTS
BC Timber Sales
Okanagan - Columbia

TSL A84538
Bigmouth
Proposed Branch 17.6E
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 5 - 0+86

Design Template Key

Template ID	Description
5M	5 meter road

Soils

Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width
T1 Till	70%	70%	0.5m X 0.3m
T2 Till - steep cut	100%	70%	0.5m X 0.3m
HR Hard Rock	400%	100%	0.5m X 0.3m

Earthworks Summary

L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+000.0		421.0	93.4	0.0
0+020.0	3.8	169.7	87.4	-417.2
0+040.0	80.4	82.1	89.6	-506.5
0+060.0	228.4	19.7	83.3	-360.2
0+080.0	340.1	30.9	40.3	-39.8
0+086.1	70.0			-0.7
Pg. Tot.	722.7	723.4	394.0	
Cum. Tot.	722.7	723.4	394.0	

Legend

Ground Topography

Profile Subgrade

Culverts

Gnd layer 1

Index Station

Vertical Scale 1:200
Horizontal Scale 1:2000

Page 1 of 1

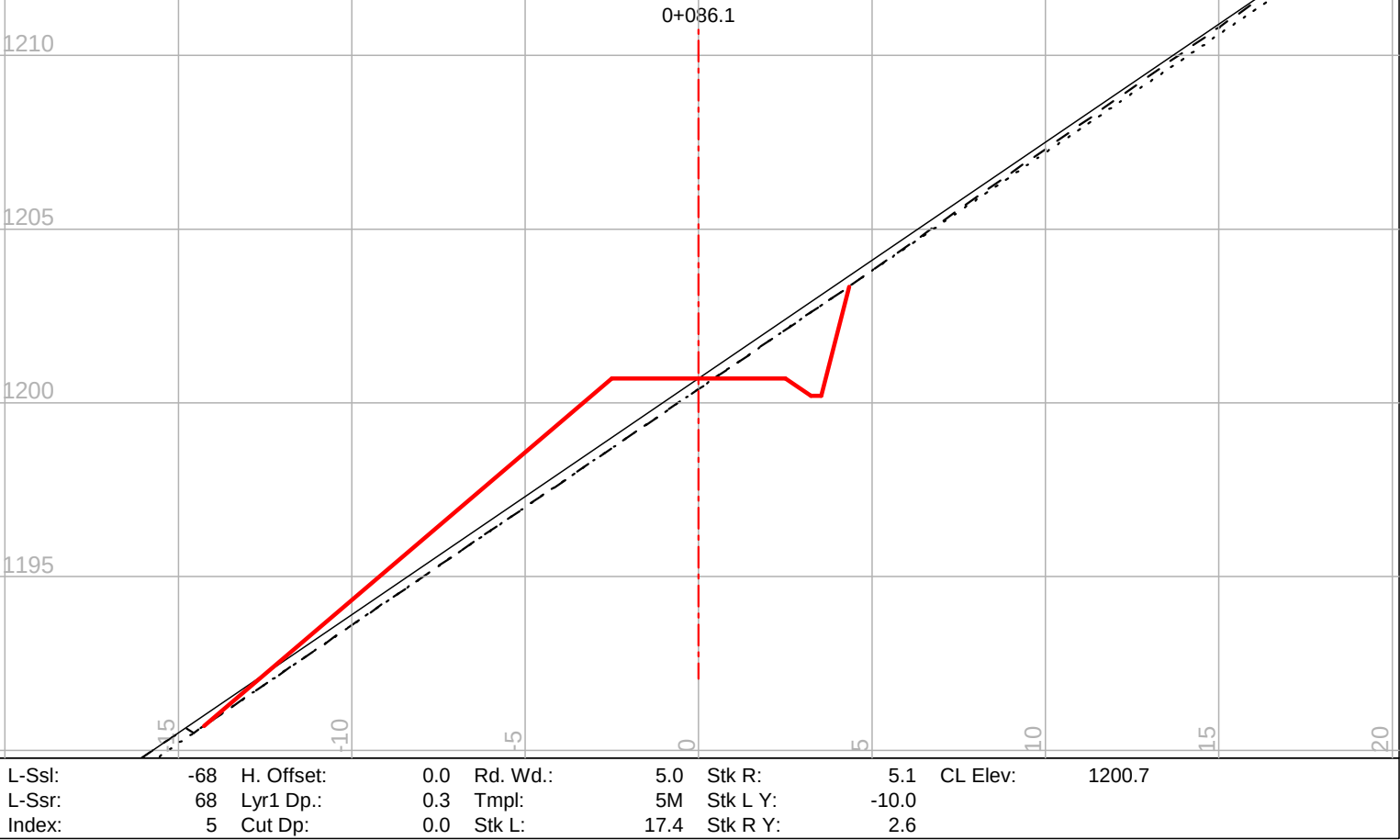
Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

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Prepared By:
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PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366



ROAD CROSS-SECTIONS



TRAVERSE NOTES

Description:

Crew:

Unit:

Survey Date:

Length: 166.9m.

Number of Shots: 11

Index	Statio	Typ	Fore	H.D.	S.D.	Slp.	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS				0								
5:1	66.9:1								**		RT#1	03871.3	45970.4	1200.7
		RS	122.0	22.0	22.0	0								
5	166.9						-68/..	68/..	TI/0.30/HR			03852.7	45982.1	1200.7
		FS	23.0	23.0	23.0	0								
4	143.9						-66/..	58/..	TI/0.30/HR			03843.7	45960.9	1200.7
		FS	12.0	12.9	13.0	12								
3	131.0						-65/..	63/..	TI/0.30/HR			03841.0	45948.3	1199.2
		FS	16.0	24.8	25.0	12								
2	106.2						-38/..	58/..	TI/0.30/HR			03834.2	45924.4	1196.2
		FS	30.0	24.7	25.0	15								
1:1	81.4:1								TI/1.50/HR		RT 13	03834.8	45892.1	1192.5
		RS	130.0	17.0	17.0	0								
1	81.4						-27/12.0 T,-60/..	36/..	TI/1.50/HR		JCT BR 17.6E	03821.8	45903.0	1192.5
		FS	30.0	17.5	18.0	23								
0	63.9						-55/..	50/..	TI/1.50/HR			03813.0	45887.8	1188.4
		FS	357.0	18.0	18.0	5								
-1	45.9						-48/15.0 T,-60/..	58/..	TI/1.50/HR			03814.0	45869.9	1187.5
		FS	350.0	30.0	30.0	0								
-2	15.9						-47/..	35/8.0 T,52/..	TI/1.50/HR		[N]POC SB	03819.2	45840.3	1187.5
		FS	357.0	15.9	16.0	10								
-3 *	0.0						-47/..	42/..	TI/1.50/HR			03820.0	45824.4*	1185.9

CULVERT SUMMARY

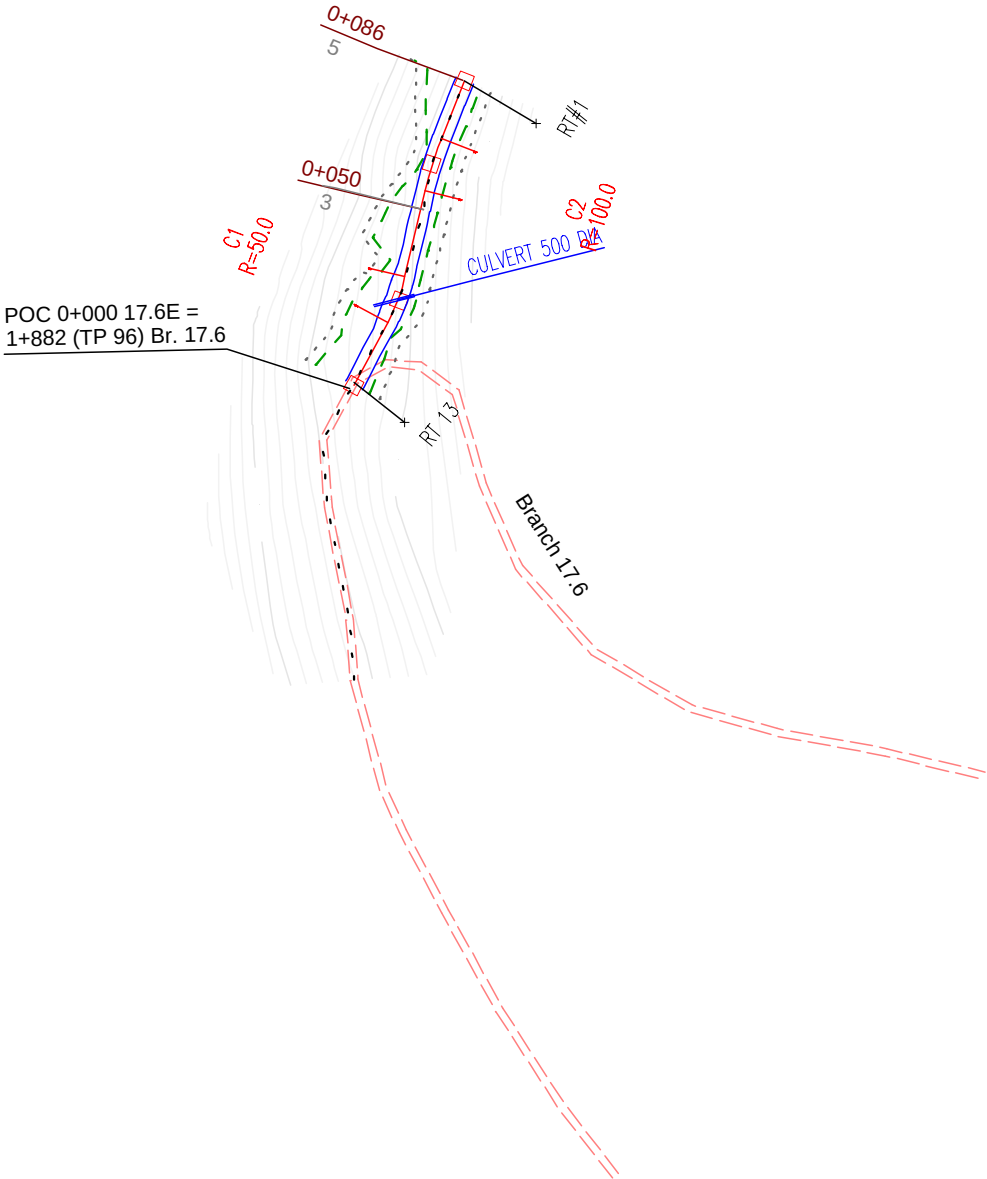
Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
	2 0+025.4	500	11	55

APPENDIX 5

Branch 17.6F

Level 2 Geometric Road Design

PLAN AND PROFILE SHEETS

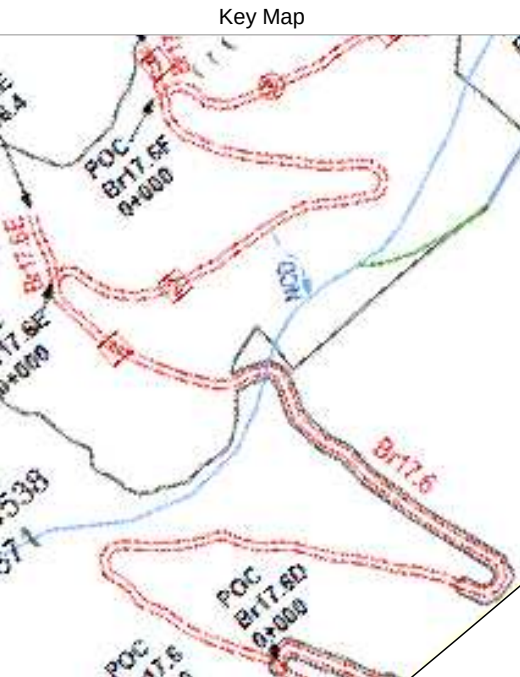


Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

- Legend
- L-Line Location
 - P-line Location
 - Road Edges
 - Slope Stake Elevation
 - Clearing Limits
 - Culverts
 - RT
 - 2m Contours
 - Proposed Road

Plan Scale 1:2000



TSL A84538
Bigmouth
Proposed Branch 17.6E
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 5 - 0+86

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

Culvert Summary

Index	L-Stn m.	Cul DIA mm.	Cul Len m.	Cul Skew deg.
2	0+025.4	500	11.0	55

Reference Point Summary

Index	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
1	0+000.7	130.0°	17.0	RT 13
5	0+086.1	122.0°	22.0	RT#1

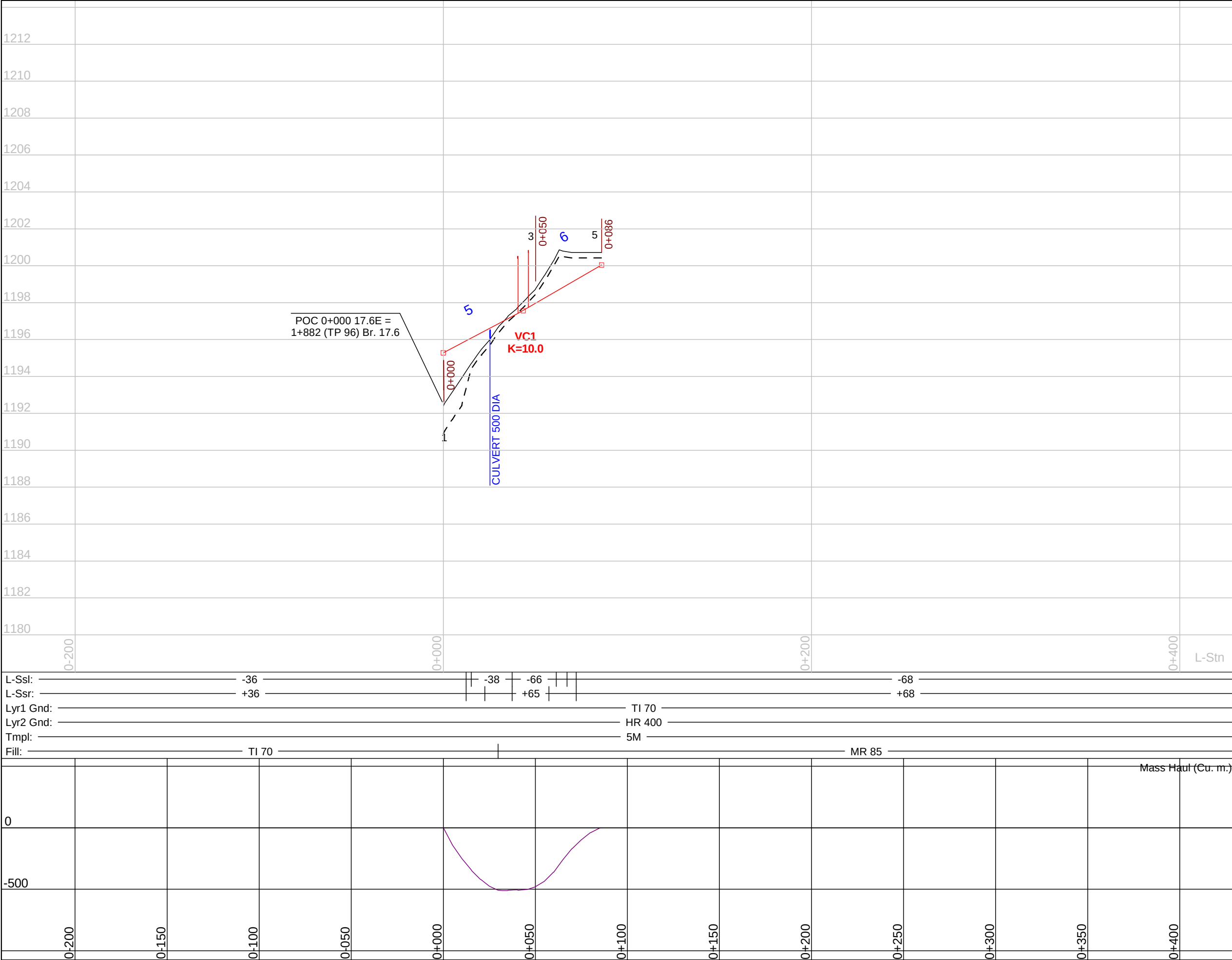
Page 1 of 1

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

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250-832-3366







BCTS
BC Timber Sales
Okanagan - Columbia

TSL A84538
Bigmouth
Proposed Branch 17.6E
UBI - 40BK68Q

Level 2 Road Survey
1 - 0+000 to 5 - 0+86

Design Template Key

Template ID	Description
5M	5 meter road

Soils

Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width
T1 Till	70%	70%	0.5m X 0.3m
T2 Till - steep cut	100%	70%	0.5m X 0.3m
HR Hard Rock	400%	100%	0.5m X 0.3m

Earthworks Summary

L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+000.0		421.0	93.4	0.0
0+020.0	3.8	169.7	87.4	-417.2
0+040.0	80.4	82.1	89.6	-506.5
0+060.0	228.4	19.7	83.3	-360.2
0+080.0	340.1	30.9	40.3	-39.8
0+086.1	70.0			-0.7
Pg. Tot.	722.7	723.4	394.0	
Cum. Tot.	722.7	723.4	394.0	

Legend

Ground Topography

Profile Subgrade

Culverts

Gnd layer 1

Index Station

Vertical Scale 1:200
Horizontal Scale 1:2000

Page 1 of 1

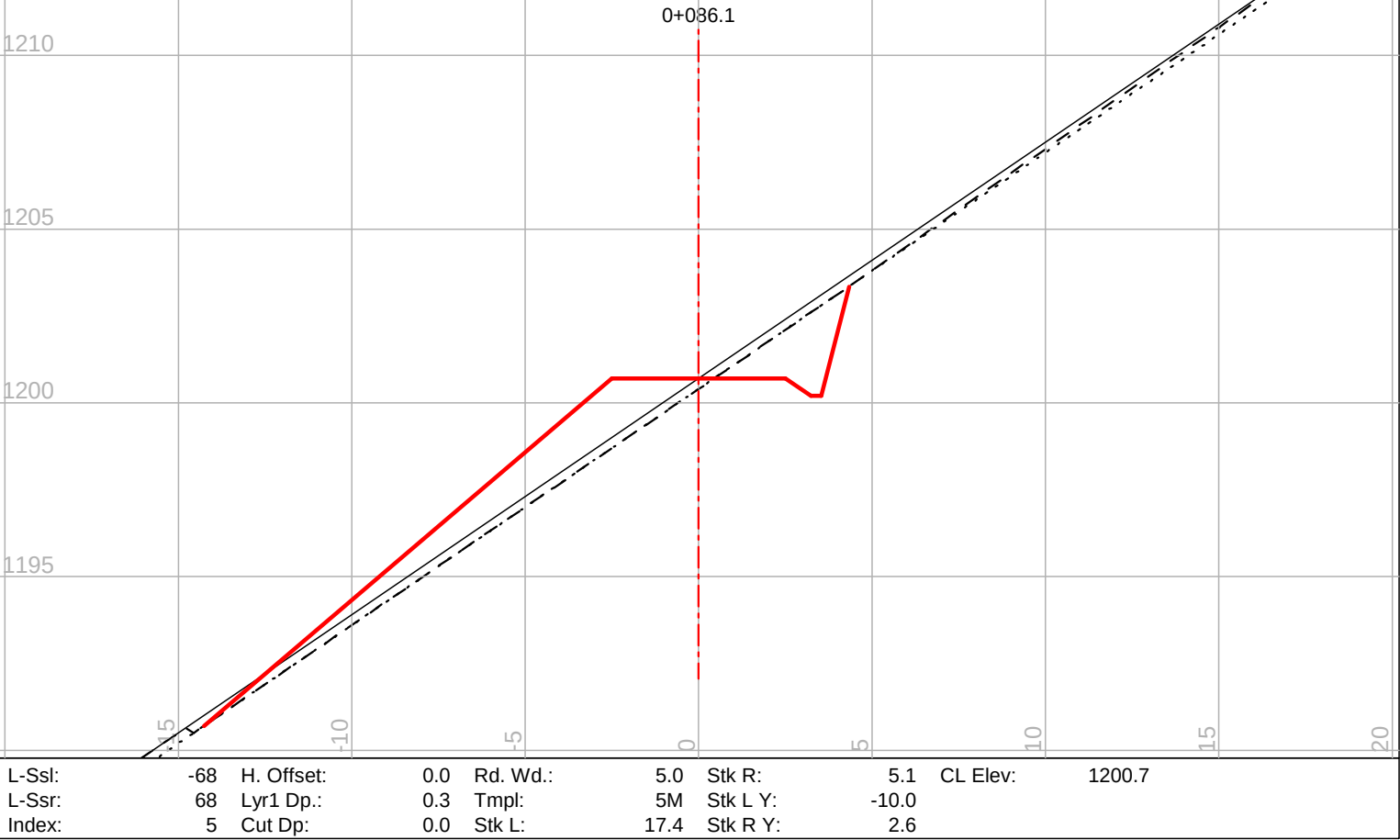
Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

S:\23\15\Current\8\Bigmouth A84538\Br 17-6E\17-6E Rd design.dsn

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Forsite Engineering & Geoscience Ltd.
PO Box 2012
Salmon Arm, BC
V1E 4R1
250-832-3366



ROAD CROSS-SECTIONS



TRAVERSE NOTES

Description:

Crew:

Unit:

Survey Date:

Length: 166.9m.

Number of Shots: 11

Index	Statio	Typ	Fore	H.D.	S.D.	Slp.	SSL Slp.(%)/S.D.	SSR Slp.(%)/S.D.	GND	CRK	Label	X	Y	Z
		FS				0								
5:1	66.9:1								**		RT#1	03871.3	45970.4	1200.7
		RS	122.0	22.0	22.0	0								
5	166.9						-68/..	68/..	TI/0.30/HR			03852.7	45982.1	1200.7
		FS	23.0	23.0	23.0	0								
4	143.9						-66/..	58/..	TI/0.30/HR			03843.7	45960.9	1200.7
		FS	12.0	12.9	13.0	12								
3	131.0						-65/..	63/..	TI/0.30/HR			03841.0	45948.3	1199.2
		FS	16.0	24.8	25.0	12								
2	106.2						-38/..	58/..	TI/0.30/HR			03834.2	45924.4	1196.2
		FS	30.0	24.7	25.0	15								
1:1	81.4:1								TI/1.50/HR		RT 13	03834.8	45892.1	1192.5
		RS	130.0	17.0	17.0	0								
1	81.4						-27/12.0 T,-60/..	36/..	TI/1.50/HR		JCT BR 17.6E	03821.8	45903.0	1192.5
		FS	30.0	17.5	18.0	23								
0	63.9						-55/..	50/..	TI/1.50/HR			03813.0	45887.8	1188.4
		FS	357.0	18.0	18.0	5								
-1	45.9						-48/15.0 T,-60/..	58/..	TI/1.50/HR			03814.0	45869.9	1187.5
		FS	350.0	30.0	30.0	0								
-2	15.9						-47/..	35/8.0 T,52/..	TI/1.50/HR		[N]POC SB	03819.2	45840.3	1187.5
		FS	357.0	15.9	16.0	10								
-3 *	0.0						-47/..	42/..	TI/1.50/HR			03820.0	45824.4*	1185.9

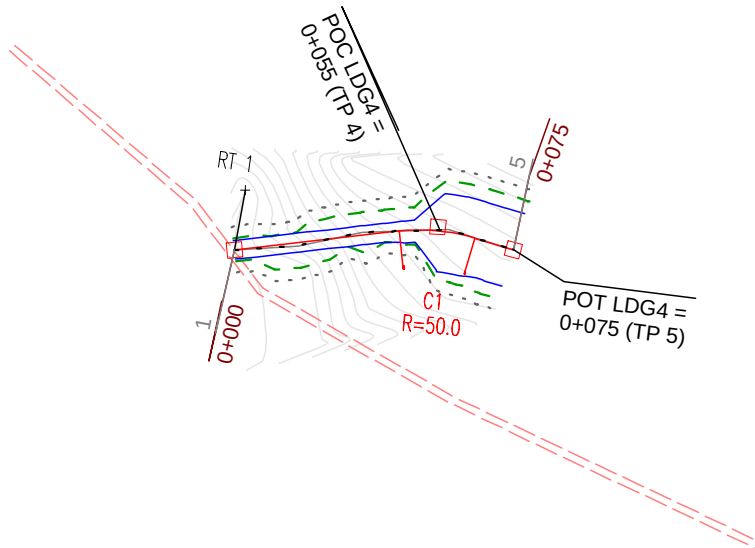
APPENDIX 6

Branch 19

Level 2 Geometric Road Design

Bigmouth 19 Road - Earthworks Volumes Data								
L-Line Distance	Index	Ground Layer 1	Ground Layer 2	Ground Layer 3	Cut Depth (m)	Cut Volume (Bank m ³)	Fill Volume (Bank m ³)	Mass Haul (Final m ³)
m.								
0+000	1	TI	HR		0.0	0	77	0
0+017	2	TI	HR		-0.4	44	48	-77
0+034	3	TI	HR		0.8	136	45	-80
0+057	4	TI	HR		0.2	193	219	14
0+075	5	TI	HR		-0.1			-5

PLAN AND PROFILE SHEETS



Magnetic declination 19 °58'

NOTE:
The data used to create this design was gathered to a Level 2 survey standard utilizing clinometer, steel tight chain and compass. The design shown here is a graphical representation of the road layout

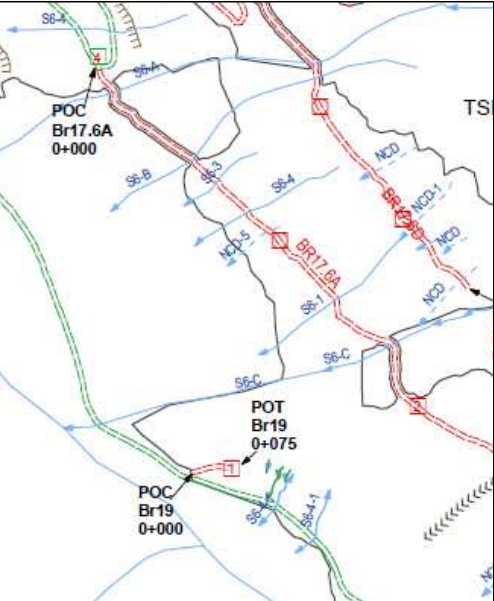
Legend

- L-Line Location
- P-line Location
- Road Edges
- Slope Stake Elevation
- Clearing Limits
- Culverts
- RT
- 2m Contours
- Proposed Road

Plan Scale 1:2000



Key Map



TSL A84538
Bigmouth
Proposed Branch 19
UBI - 40BK670

Level 2 Road Survey
1 - 0+000 to 5 - 0+075

Design Template Key

Design Speed	20km/h
Stabilized Road Width	5.0m
Max Sustained Fav. Grade	16%
Max Short Pitch Grade	20%
Max Sustained Adv Grade	-8%
Max Short Pitch Grade	-10%

Culvert Summary

Reference Point Summary

Index	L-Stn m.	RS1 Az deg.	RS1 HD m.	RS1 Cmt
1	0+000.0	3.0°	16.0	RT 1

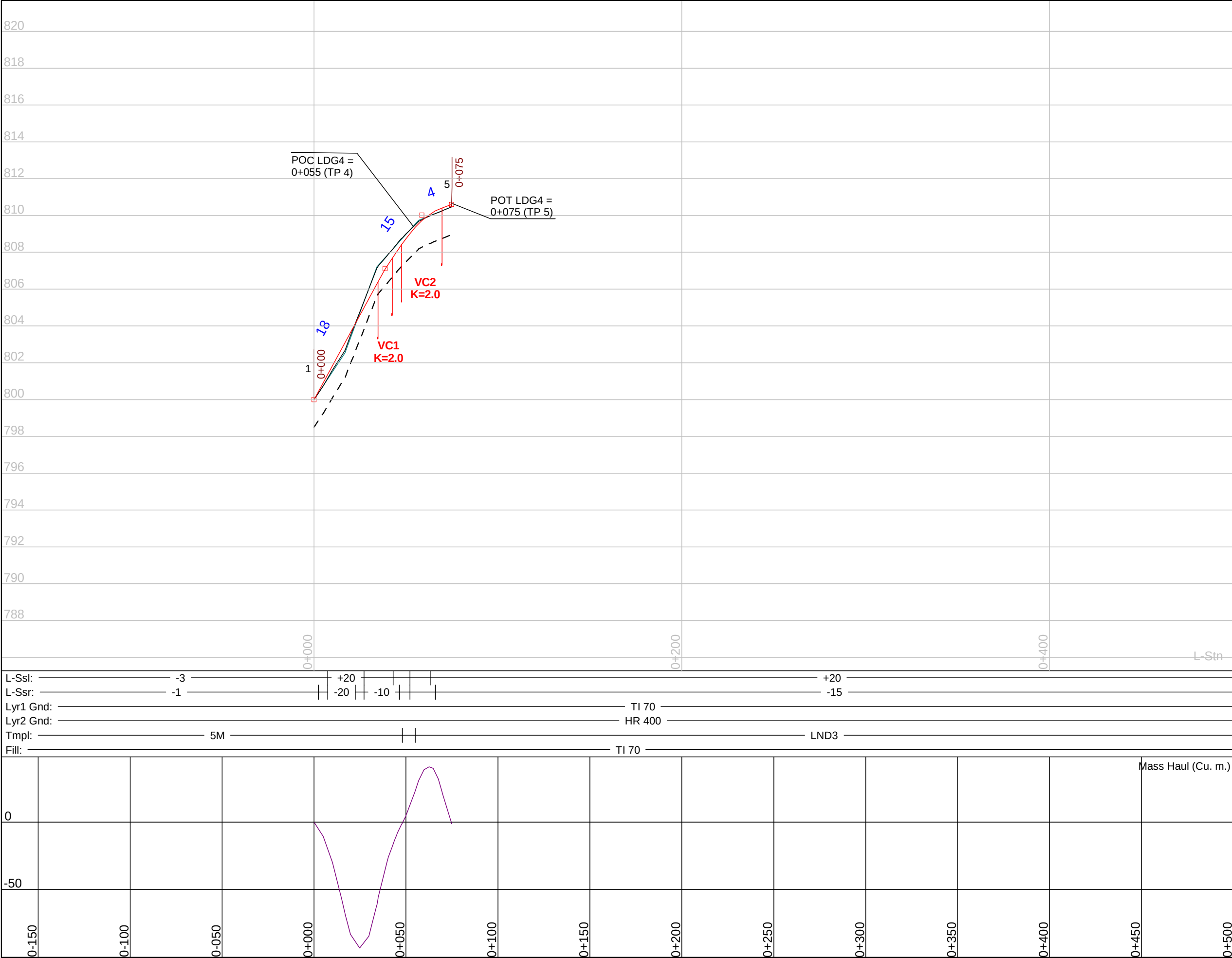
Page 1 of 1

Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng

S:\23\15\Current\8\Bigmouth A84538\Br 19\Br 19 rd design.dsn

Prepared By:
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BCTS

BC Timber Sales

Okanagan - Columbia

TSL A84538
Bigmouth
Proposed Branch 19
UBI - 40BK670

Level 2 Road Survey
1 - 0+000 to 5 - 0+075

Design Template Key	
Template ID	Description
5M	5 meter road
TP	Taper template
LDG	Landing template

Soils			
Soil Type	Cut Slope	Fill Slope	Ditch Depth/Width
T1 Till	70%	70%	0.5m X 0.3m
T2 Till - steep cut	100%	70%	0.5m X 0.3m
HR Hard Rock	400%	100%	0.5m X 0.3m

Earthworks Summary				
L-Stn m.	Cut V. Cu. m.	Fill V. Cu. m.	Strip V. Cu. m.	Mass H. Cu. m.
0+000.0		85.1	55.8	0.0
0+020.0	1.6	24.2	66.2	-83.5
0+040.0	79.7		106.4	-28.0
0+060.0	138.9	71.7	123.7	39.2
0+074.8	149.0	189.2		-1.0
Pg. Tot.	369.2	370.2	352.0	
Cum. Tot.	369.2	370.2	352.0	

Legend

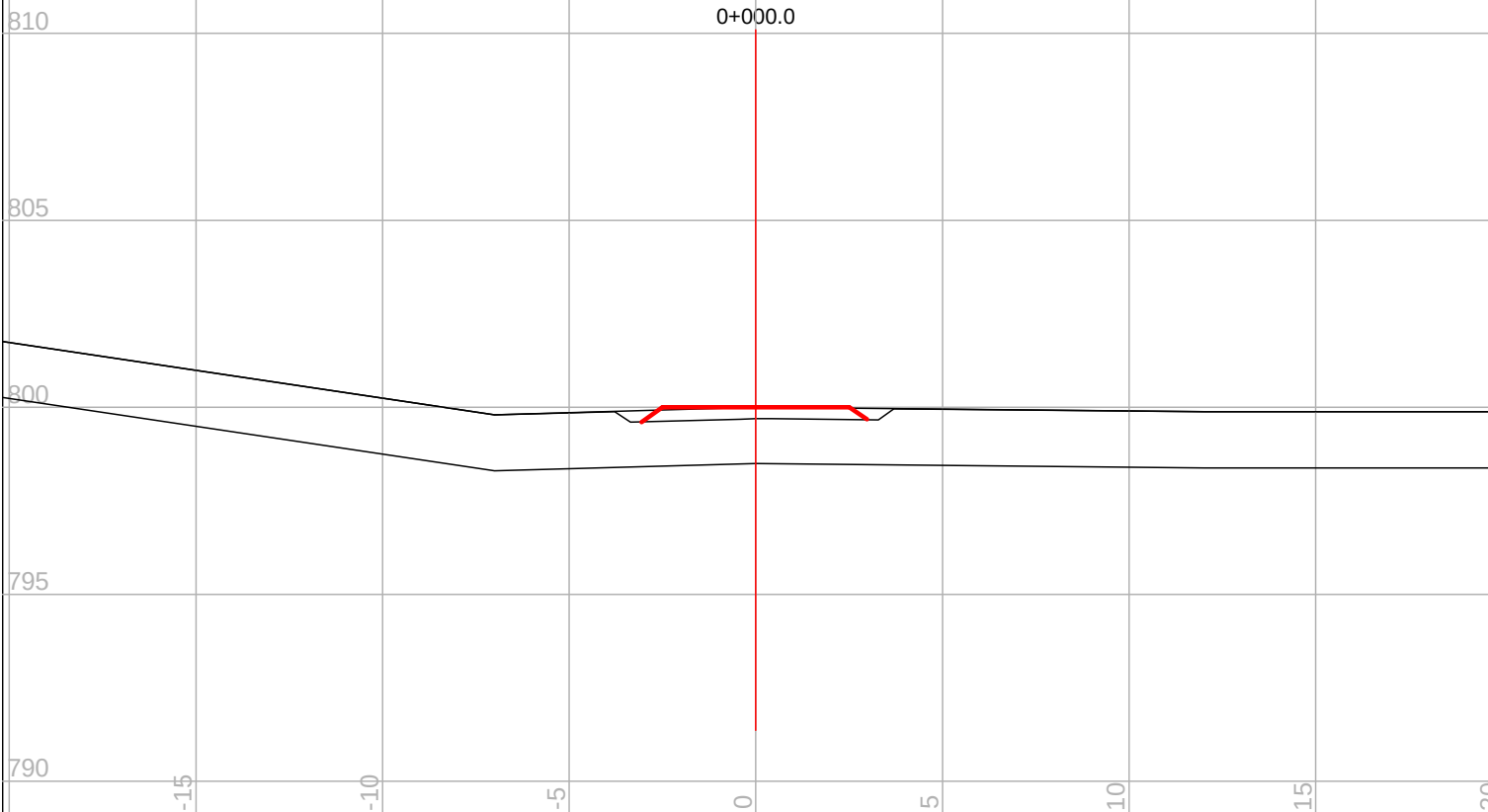
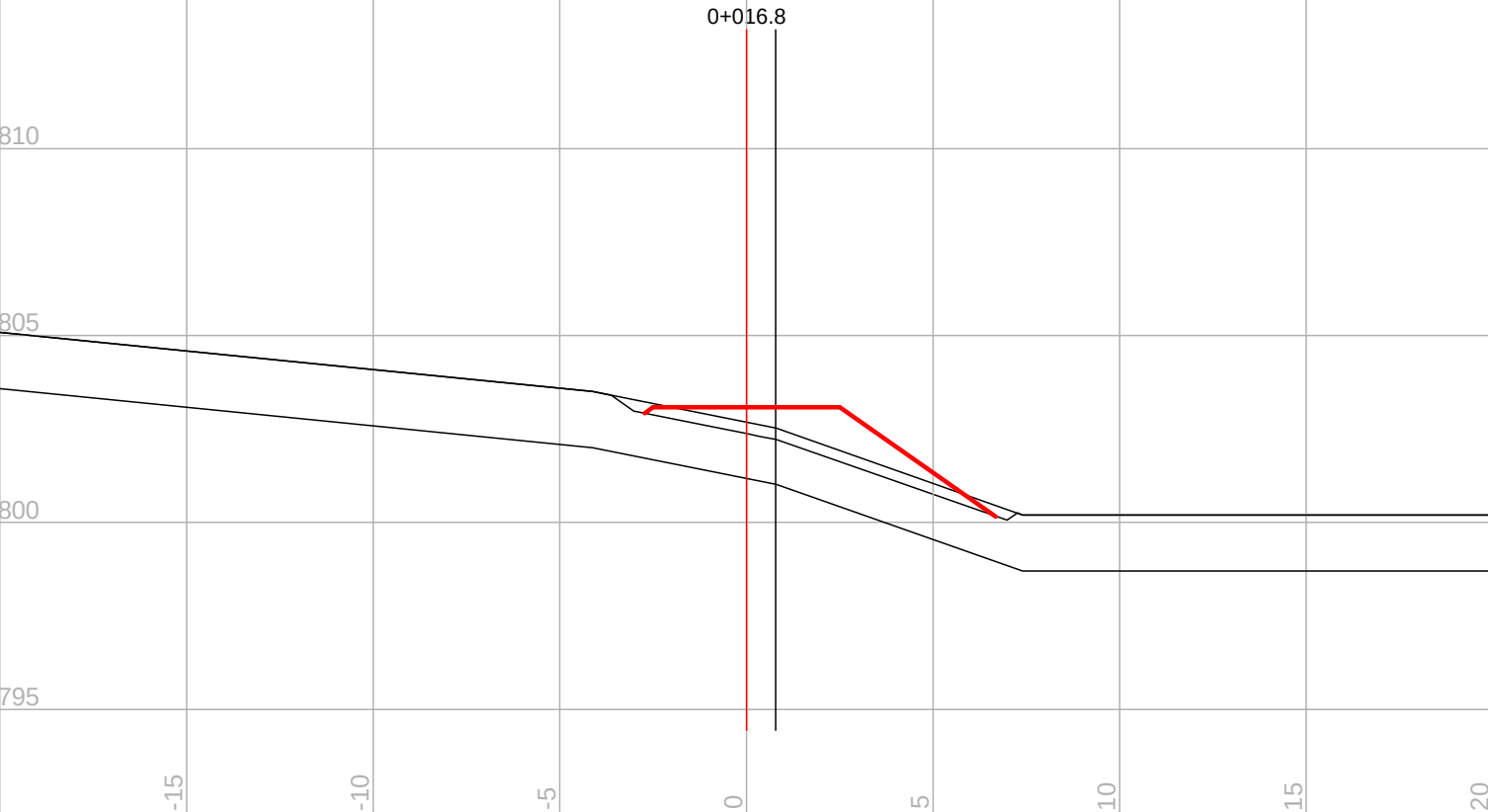
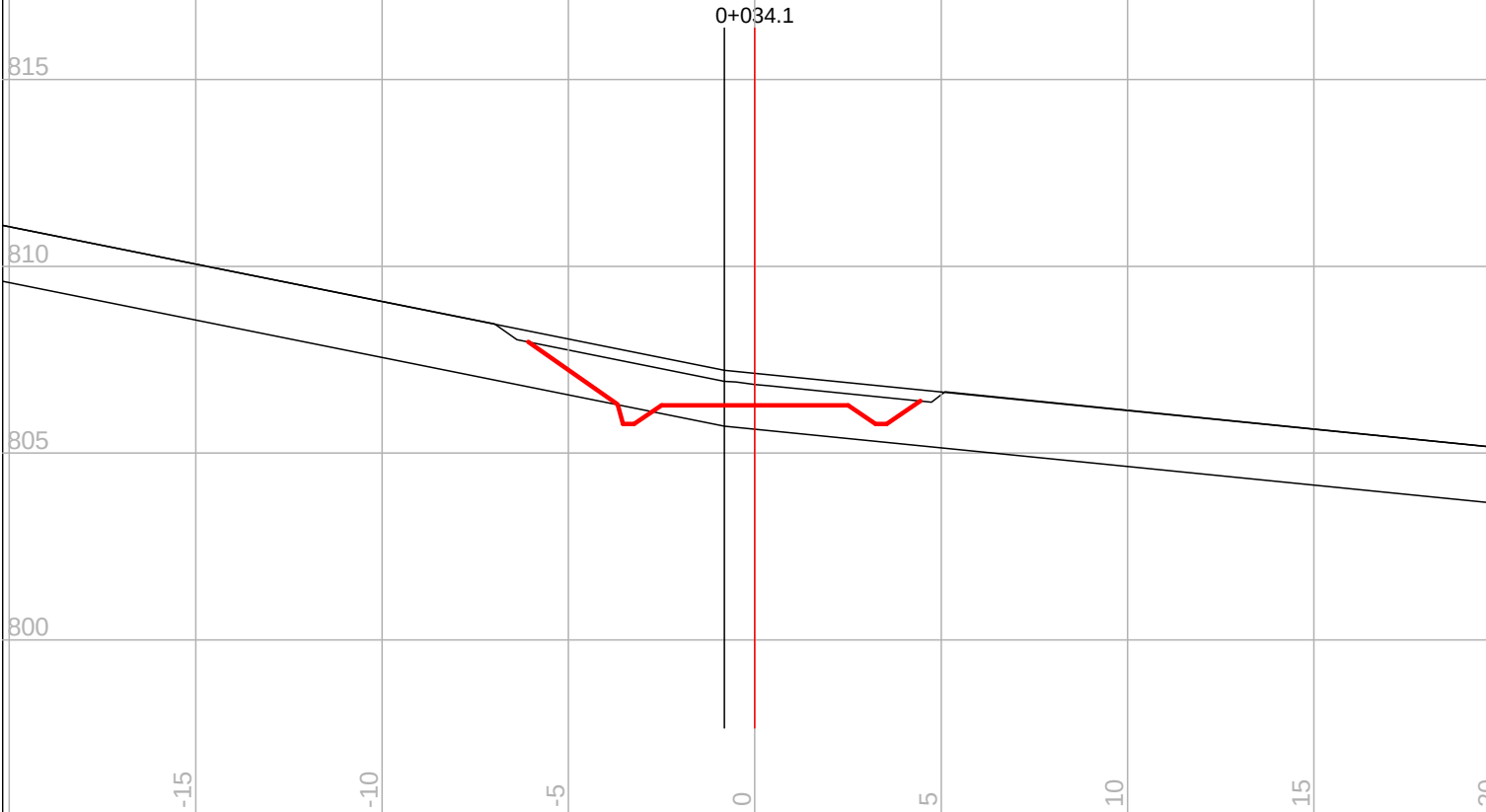
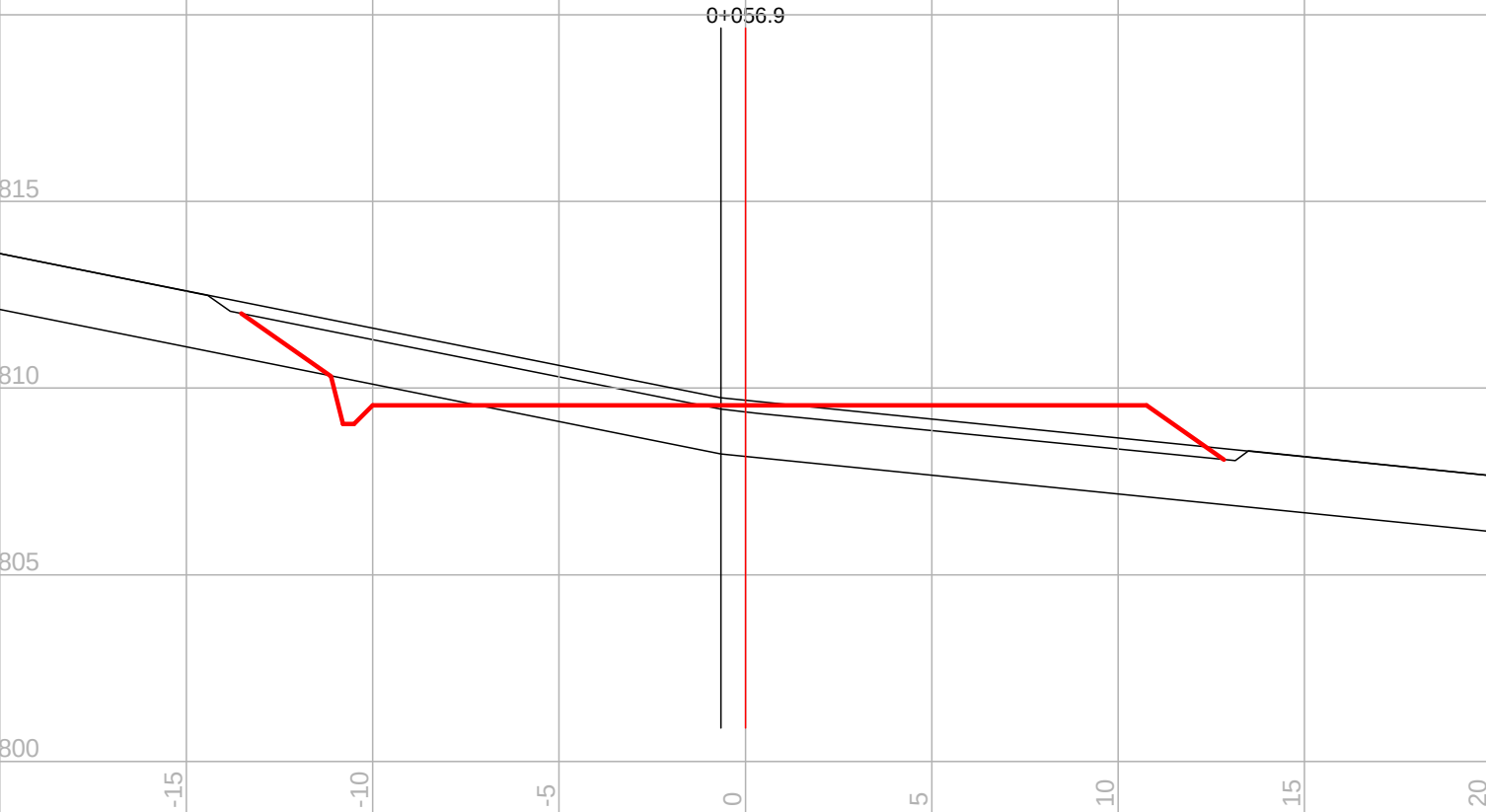
- Ground Topography
- Profile Subgrade
- Culverts
- Gnd layer 1
- Index Station

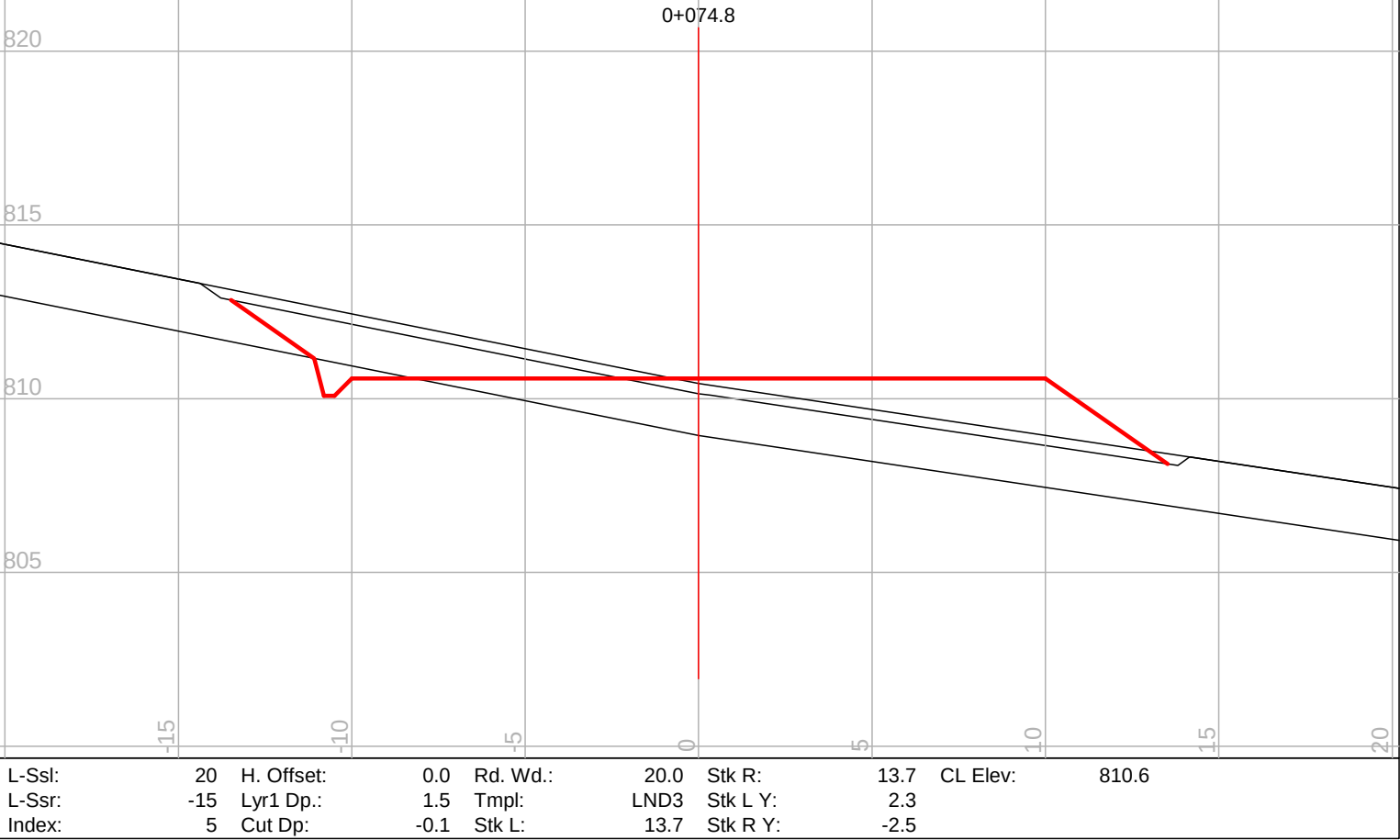
Vertical Scale 1:200 Horizontal Scale 1:2000			
Page 1 of 1			
Design Date	09/04/09	Design By:	Brett Barnard, FIT
Plotting Date	09/05/13	Checked By:	Michael Foster, P.Eng
S:\23\15\Current\8\Bigmouth A84538\Br 19\Br 19 rd design.dsn			

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ROAD CROSS-SECTIONS

ROADENG Section										Scale 1:200		P. 1							
U:\Projects\23\15\Current\8\Bigmouth A84538\Br 19\Br 19 rd design												09/10/16							
																			
L-Ssl: -3 H. Offset: 0.0 Rd. Wd.: 5.0 Stk R: 3.0 CL Elev: 800.0 L-Ssr: -1 Lyr1 Dp.: 1.5 Tmpl: 5M Stk L Y: -0.4 Index: 1 Cut Dp: 0.0 Stk L: 3.1 Stk R Y: -0.3										L-Ssl: 20 H. Offset: -0.8 Rd. Wd.: 5.0 Stk R: 7.1 CL Elev: 803.1 L-Ssr: -20 Lyr1 Dp.: 1.5 Tmpl: 5M Stk L Y: -0.2 Index: 2 Cut Dp: -0.4 Stk L: 2.7 Stk R Y: -2.9									
																			
L-Ssl: 10 H. Offset: 0.8 Rd. Wd.: 5.0 Stk R: 4.5 CL Elev: 806.3 L-Ssr: -10 Lyr1 Dp.: 1.5 Tmpl: 5M Stk L Y: 1.7 Index: 3 Cut Dp: 0.9 Stk L: 6.1 Stk R Y: 0.1										L-Ssl: 10 H. Offset: 0.7 Rd. Wd.: 20.8 Stk R: 12.9 CL Elev: 809.5 L-Ssr: -10 Lyr1 Dp.: 1.5 Tmpl: LND3 Stk L Y: 2.5 Index: 4 Cut Dp: 0.1 Stk L: 13.7 Stk R Y: -1.5									



TRAVERSE NOTES

Number of Shots: 6

[illegible]

APPENDIX 7

Schedule A6



Schedule "A"

SD09TKR020

FOR TIMBER AND ROAD DEVELOPMENT
REVELSTOKE NORTH

CONTRACT ADMIN. NO.:
SD09TKR020

ATTACHMENT TO CONTRACT DATED FOR
REFERENCE THE 3rd DAY OF APRIL, 2008.

SPECIFICATIONS

ARTICLE 1 GENERAL

1.01 This is a multi activity contract. The Contractor shall provide any or all of the following services as outlined in the Schedule B-1 (Proposed Work Schedule):

- a) Timber and road reconnaissance
- b) Engineering of harvest blocks
- c) Road engineering and road layout
- d) Road survey and design
- e) Timber cruising
- f) Mapping
- g) Field reconnaissance/preliminary planning
- h) Geotechnical assessment of proposed roads and blocks
- i) Avalanche assessment of blocks
- j) Digital terrain modelling
- k) Bridge site plan
- l) Stream classification
- m) Legal land survey

Contractor's Personnel

- 1.04 Prior to the commencement of Work, the Contractor shall provide the Ministry Representative with the names of the individuals who will be performing the functions listed in Article 1.0, Clause 1.01 a to d (inclusive) and g to k (inclusive).
- 1.05 The Contractor shall ensure that:
- a) All individuals evaluated and accepted under the Conditions of Tender for this Agreement be engaged in the execution of "a to d" (inclusive), "g", and "k", of Article 1.0, Clause 1.01 of this Agreement.
 - b) Substitution of any individual evaluated and accepted under this contract is subject to approval by the Ministry Representative.

Facilities and Information Furnished by the Province

- 1.06 Base data is available through the Land & Resource Data Warehouse (LRDW) and shall be obtained by the Contractor as detailed in the attached "BCTS Spatial Data Standards 2008". The Province may also supply the following data where available:
- a) Forest Development Plan maps
 - b) Layout maps and Total Harvest Chance Plans (where available)
 - c) Road Plans and profiles
 - d) Templates for Site Plan, Harvest Plans, Appraisal, and Cruise Maps.
 - e) Level D geotechnical assessments (where available).

ARTICLE 2 STANDARDS OF PERFORMANCE AND WORK PROGRESS

Work Progress Plan

- 2.01 Clause 6.03 of the FS 1000 is replaced with the following:
For the purposes of this agreement, Schedule B-1 shall be the Work Progress Plan.

Daily Accounting

- 2.02 The Contractor shall keep a detailed daily account for all contract time. The daily account shall accompany and support each invoice. Accounts shall consist of a table detailing the following:
- The dates and the number of hours worked by all personnel being claimed for.
 - The project(s) the personnel worked on referenced by Unique Block Identifier (UBI), or road number.
 - The type of work the personnel were engaged in as per Schedule B-1.
 - The names of the personell conducting the work.
 - An accompanying Invoice Summary (FS 1221).

Traverse/GPS/Survey Level Standards

2.03

ITEM	TYPE OF MEASUREMENT REQUIRED	ALLOWABLE ERROR
Harvest unit boundary*	Global Positioning System (GPS)	As per MOF "Standard Procedures for Line and Polygon Mapping using Global Positioning System Technology"
Harvest unit boundary (if no GPS signal)	Closed hand traverse (tight chain or laser)	1% closure error. Minimum of 2 ties to geographic features on forest cover base map.
All Roads	Hand traverse (tight chain or laser) Minimum of 2 GPS ties at beginning and end points.	As per Forest Practices Code (FPC) Forest Road Engineering Guidebook Road Survey Level 3 standards.
Deflection/profile lines	Hip chain (string traverse)	1% horizontal and vertical accuracy

- * The Contractor shall use Global Positioning Systems (GPS) for measurement and placement of cutblock boundaries. The Contractor may use hand traversing only in the event that GPS cannot be used due to a lack of suitable signals.

Mapping Standards

- 2.04 All mapping must be in digital form regardless of the data capture method used. All digital mapping data shall conform to the standards stated in the attached "BCTS Spatial Data Standards 2008".
- 2.06 Data transfer medium shall be FTP server.
- 2.07 For each cutblock, the Contractor shall produce the following maps on the templates provided by the Province:

Site Plan Maps

- Cutblock (timber sale) boundaries.
- A minimum of two geographical tie points or GPS stations
- Road and landing locations (existing and proposed)
- Natural topographic features (i.e. creeks, lakes, open swamp, fire boundaries, immature types, avalanche chutes, rock outcrops, etc.), adjacent tenures, private land etc.
- Streams with stream classification and riparian reserves (where applicable).
- Wildlife Tree Patches (WTP's) and No Harvest Zones (NHZ's)
- Standards unit boundaries. SU's shall be labeled numerically (ie 1, 2 etc)
- Total gross area of the block
- Total area of roads and landings
- Total net area to reforest (NAR)
- Biogeoclimatic site series (as determined by the Ministry Representative)
- A header stating "Site Plan", with timber sale number, location, date, scale, Unique Block Identifier (UBI) number, and opening number.
- A scale bar and North arrow.
- Latitude and longitude of block.
- Minimum and maximum elevation of block.

Harvest Plan Maps

- a) Cutblock Boundaries including falling corners.
- b) Road and landing locations (existing and proposed).
- c) Road stations at start and end of road as well as at landing and stream locations.
- d) Harvesting system boundaries.
- e) Natural topographic features (i.e. creeks, lakes, open swamp, fire boundaries, immature types, avalanche chutes, rock outcrops, etc.).
- f) Deflection lines.
- g) Yarding directions.
- h) Total hectares by harvest system.
- i) Skid trails (where applicable).
- j) Intermediate support trees (where applicable).
- k) Streams with stream classification and riparian reserves (where applicable).
- l) Side slopes or contours
- m) Wildlife tree patches (WTP) and /or No Harvest Zone (NHZ) patches.
- n) Total gross area of block;
- o) Total area of roads and landings.
- p) Total net area to reforest (NAR).
- q) A summary of Critical Site Factors (as determined by Ministry Representative).
- r) Tenure Identification and UBI

Appraisal Maps

- a) If requested by the Ministry Representative, the Contractor shall prepare an Appraisal Map to the standards outlined in the BC Interior Appraisal Manual. In addition to this standard, the appraisal map shall include an area summary by indicating each block's gross, net, and merchantable area.
- 2.09 If requested by the Ministry Representative, the Contractor shall accurately place geo-referenced cutblocks and roads on the 1:20,000 scale Forest Development Plan (FDP) base or other specified base.
- 2.10 If hand traversing is used, and if requested by the Ministry Representative, the Contractor shall supply a hard copy of the computer printout used in compilation of traverse entries. The closing error of the traverse for each timber sale/cutblock must be shown.
- 2.11 If requested by the Ministry Representative for GPS maps, the Contractor shall submit a corresponding GPS printout showing latitude/longitude by station.

Timber Cruising Maps

- 2.12 For each block timber cruised, the Contractor shall produce a Cruise Plan map as per the Cruising Manual.
- 2.13 Upon completion of timber cruising, the Contractor shall prepare a Final Cruise map as per the Cruise Manual. It shall be included in the check cruise package, and it shall be attached to the final cruise compilation.

Deflection/Profile Lines

- 2.14 Deflection and profile lines shall be clearly tied and identified on harvest plan maps.
- 2.15 All deflection lines and profile lines shall be plotted on "Logger PC" or an equivalent computer based program.
- 2.16 Deflection analysis reports shall be submitted as a single PDF document per block.

Field Marking Standards

2.17 The following field markings shall be used:

PURPOSE	FLAGGING COLOUR/MARKER
Profile/Deflection Line	Blue/White Candy Stripe flagging
Cutblock Boundary	Orange printed "BOUNDARY" flagging/ Blue Paint - 2 horizontal lines
Skid/Forwarding Trail/Backspar	Red printed "SKID TRAIL" flagging
Split Line	Orange/Black Candy Stripe flagging
Falling Corner	Blaze, orange paint, boundary flagging, permanent marker indicating Blk #, FC# and initials.
Riparian Reserve	Orange printed "RIPARIAN RESERVE" flagging
Tool/Rig Trees	Orange Paint (Yellow/Black Candy Stripe flagging)
Landing Location	3 pink flagging ribbons and a blaze labelled with landing #
Wildlife Tree	Orange "WILDLIFE TREE" flagging
Cruise Plot Center	Blue & Yellow flagging
Cruise Strip Lines	Blue flagging
Tally Trees	Orange Paint numbered sequentially
"Out" Trees	Orange Paint "X"
P-Line	Yellow flagging
L-Line	Pink printed "CENTRELINE or ROAD" flagging
Road Right of Way	Red & Blue flagging
Road Reference Point	Metal Plaque, Blazed Tree
Road Survey Traverse Stations/Slope Stakes	Wooden stake ¾"x2"x3', painted orange labelled with waterproof ink
GPS Traverse Hubs	Aluminum Tag
Skid Bridge	Red printed "SKID BRIDGE" flagging
Creeks	Yellow printed "CREEK" flagging

2.18 The Contractor shall ensure that all flagging ribbon and all marking is clearly intervisible.

2.19 The Contractor shall hang all flagging ribbon and shall paint at a minimum of 2 metres above the ground to ensure visibility during winter harvest.

2.20 The Contractor shall use winter weight premium flagging ribbon for all marking. Biodegradable and/or polypropylene ribbon shall not be used.

ARTICLE 3 FIELD WORK**Reconnaissance**

3.01 If requested by the Ministry Representative, the Contractor shall gather and record information on slope, topographic features (i.e.: rock, talus, potential instabilities), timber types, estimated timber volumes, possible road and block location and any other information specified by the Ministry Representative.

3.02 Profile lines shall be run if directed by the Ministry Representative.

Block Engineering

3.03 General Conditions

- a) On blocks with multi-harvest systems, split line boundaries shall be field located with flagging, traversed with GPS, and accurately mapped as per the mapping standards in this agreement.
- b) Unless otherwise specified by the Ministry Representative, the Contractor shall paint all block boundaries once the final boundary has been determined and approved by the Ministry Representative.
- c) The Contractor shall consider the total harvest chance and shall avoid isolating timber.
- d) For in-block and adjacent streams, the Contractor shall use the following procedures for stream classification:
 - i. All in-block and adjacent S6 or larger streams shall be ribboned, GPS traversed, and mapped. Significant Non-Classified Drainages (NCD's) (ie those that may impact harvesting) shall, also be flagged, GPS'd and mapped.
 - ii. For stream gradients greater than 20%, the contractor shall provide an estimated stream classification based on stream width and the corresponding Forest and Range Practices Act (FRPA) classification system.
 - iii. For stream gradients less than 20%, the contractor shall assume they are fish bearing and shall measure a minimum of 6 stream widths (to high water mark) evenly spaced over each stream reach. The average of these measurements shall be used to derive the stream classification. The contractor shall provide this data to the Ministry Representative.
- e) Based on the stream classification, and unless indicated by the Ministry Representative, the Contractor shall incorporate the basal area requirement of the RMZ as a percentage addition to the RRZ, and shall locate this addition into adjacent WTP's if possible. The Contractor shall not ribbon riparian management zones or "no machine buffers", unless specified by the Ministry Representative.
- f) Blocks must not exceed 40hectares unless allowed by Ministry Representative. In order to be classed as separate blocks the amount of timber between blocks must exceed two tree lengths
- g) Access-a proportion of the work areas will require quad access on existing road systems.

3.04 Ground Based Systems

- a) The Contractor shall field locate, ribbon, and GPS skid trails **if** requested by the Ministry Representative.
- b) The Contractor shall ribbon skid-bridge locations if requested by the Ministry Representative.
- c) As a guideline, the Contractor shall use a maximum of 300 metres for skidding distance to landing. Longer skids may be used where it is demonstrated to be functional and reasonable. Variations shall be discussed with Ministry Representative. Adverse skids shall be discussed with the Ministry Representative.
- d) Maximum slopes for ground based harvesting shall comply with WCB regulations.

3.05 Cable Based Systems

- a) Proof of deflection on each cable block is required.
- b) The Contractor shall ensure that the boundary is sufficient for below landings debris disposal and for guy line clearings relative to the tower size proposed.
- c) The Contractor shall consider the use of intermediate supports and elevated tail rigging where feasible, and shall mark a minimum of two (2) intermediate support trees per setting in the field.
- d) Sufficient deflection lines shall be run on each cable cutblock regardless of yarding system, with more lines being run on areas of the block where poor deflection is determined.
- e) For partial cutting, the Contractor must run a minimum of one (1) deflection line per yarding corridor from each tower setting.
- f) All deflection/profile lines shall be clearly identified and ribboned in the field.
- g) Where roadside yarding is specified, the Contractor shall traverse deflection lines perpendicular to the contour. For fixed yarders, deflection lines shall be run radially from each fixed yarder landing location.
- h) For the purposes of layout and deflection analysis, the Contractor shall use a tower height of 15 to 21 metres, a maximum yarding distance of 250 metres, and tailholds of 1.3 metres. The Contractor may vary from these parameters where it is demonstrated to be functional and reasonable. Variations must be discussed with the Ministry Representative.
- i) For blocks that have both uphill and downhill yarding, the split line will be clearly marked, traversed with GPS, and accurately mapped.
- j) For downhill yarding, the Contractor shall consider the post road construction cut slopes to ensure there is adequate landing area and that all wood can be safely landed.
- k) The Contractor shall not use forwarding trails for cable harvest units unless discussed and approved by the Ministry Representative.
- l) The Contractor may elevate tailholds to a maximum of 3m for deflection analysis. Higher tailholds must be discussed and pre-approved by the Ministry Representative.

Helicopter Based Systems

- 3.06 The Contractor shall ensure there are suitable landing sites for all blocks engineered for helicopter yarding. Proposed landing locations shall be identified in the field and their location accurately geo referenced using GPS.
- 3.07 The Contractor shall ensure that there is a minimum of one (1) production landing and one (1) service landing per block.

Road Engineering

- 3.08 The Contractor shall notify the Ministry Representative of completion of the preliminary P- line for review.
- 3.09 All P-line locations must be reviewed and approved by the Ministry Representative to determine road design requirements. Approval of the P-line location does not absolve the Contractor of road design standards specified in this Agreement.
- 3.10 For roads requiring geometric road design, the Contractor shall:
 - a) Conduct a road survey to FPC Forest Road Engineering Guidebook Survey Level 2 or 3 Standards depending on terrain.
 - b) Describe soils as shown in Appendix 1 of the FPC Forest Road Engineering Guidebook or by the Unified Soil Classification System. Depth to rock must be estimated at all traverse stations using ecological indicators.
 - c) Collect sufficient information to classify all streams by slope and stream width using the methods outlined in Clause 3.03 (e (ii, iii)).
 - d) Record landing locations and size as part of the road survey.
 - e) Record legible survey notes and submit a copy for review by the Ministry Representative.

Bridge Site Plan Survey

- 3.11 Where specified, the Contractor shall conduct a bridge site plan survey using the methods described in the FPC Forest Road Engineering Guidebook.

Construction Surveys

- 3.12 For all roads, the Contractor shall:
- Ribbon the right-of-way to reflect the approved road design.
- For roads requiring geometric road design, the Contractor shall complete the following additional work:
- On sections of road located on side slopes greater than 50% or where a high likelihood of landslides exists, establish one slope stake at traverse stations no further than 30m apart, offset outside of the right-of-way boundary, and mark the stake with the following:
 - Corresponding station number
 - Offset slope distance from the beginning of cut, labelled "O/S"
 - Cutslope ratio

Timber Cruising

- 3.13 Timber cruising and cruise compilation will be completed according to Ministry of Forests standards as outlined in the Provincial Cruising Manual.
- 3.14 Cruise Plans shall be submitted to the Ministry Representative and shall be signed by the Contractor.
- 3.15 The Contractor shall conduct all cruising using an electronic data logger with Cruisemate (or equivalent) software.
- 3.16 Submission packages for check cruising, strip notes, and a map clearly showing final plot locations and numbers, and final strata boundaries.
- 3.17 Upon approval of the Check Cruise, the Contractor shall proceed with the compilation. The compilation shall be in digital format as a PDF file and either a DAT or CCP file.

ARTICLE 4 GEOMETRIC ROAD DESIGN

Methods

- 4.01 The Contractor shall use the road design methods outlined in the FPC Forest Road Engineering Guidebook.
- 4.02 Where input from a qualified professional has been obtained, the Contractor shall incorporate those recommendations into the road design.
- 4.03 The Contractor shall incorporate all landings into the road design.
- 4.04 The Contractor shall use 500 mm culverts and cross drains as the minimum diameter. Culvert lengths shall be a minimum of 8 metres long.
- 4.05 The Contractor shall add 3 metres of clearing width from the top of the cut and from the bottom of the fill unless otherwise instructed by the Ministry Representative.
- 4.06 The Contractor shall use the following table as a guide for cross drain spacing:

EROSION HAZARD	SLIGHT	MODERATE	HIGH
MORE THAN 50% BY SOIL TYPE	HARDPAN, SOLID ROCK	GRAVEL, COBBLES	SANDS, SILTS, CLAYS
Road Gradient			
0 – 3%	350 m	300 m	250 m
3 – 8%	250 m	200 m	150 m
8 – 15%	200 m	150 m	100 m
15%+	150 m	100 m	Less than 100 m

- 4.07 The Contractor shall submit a preliminary design and mass graph for review by the Ministry Representative prior to submission of the final design.

Report Requirements and Formats

- 4.08 The Contractor shall provide all reports listed in the FPC Forest Road Engineering Guidebook with the following changes:
- i) The Contractor is not required to prepare estimated material and construction costs, or to specify construction equipment to be used.
 - ii) Plans and profiles shall contain the design/revision date.
 - iii) Plans and profiles shall contain a legend, and a scale bar.

Plans

- 4.09 The Contractor shall submit plan drawings as a PDF document formatted for 11X17 paper. Plans shall be prepared in 500 metre sections with a minimum 50 metre overlap between drawings at a 1:2000 horizontal and 1:200 vertical scale. In addition to the requirements listed in the FPC Forest Road Engineering Guidebook, the plan shall include a table with template assignments, and a table with design specifications.

Profiles

The Contractor shall submit profile drawings as a PDF document formatted for 11X17 paper. The profiles shall be the same scale as the plans and each profile section shall correspond to the associated plan section. Profiles shall contain any special design notes such as sections of long push and end haul, etc.

Mass Haul Diagram

- 4.11 The mass haul diagram shall be plotted at the bottom of the profile and shall correspond to the associated road section drawing.

Cross Sections

- 4.12 The Contractor shall submit cross sections as a PDF document formatted for 11X17 paper. The cross sections shall correspond to the associated plan and profile drawings.

Other Required Reports

- 4.13 The Contractor shall provide all other reports listed in the FPC Forest Road Engineering Guidebook as a PDF document formatted for 8.5X11 paper.

Bridge Site Plan Report

- 4.14 Where specified, the Contractor shall produce a bridge site plan using the methods specified in the FPC Forest Road Engineering Guidebook. The bridge site plan shall be provided as a PDF document.

Professional's Statement

- 4.15 Where a qualified professional (as described in Article 5.06) has made specific recommendations to be incorporated into the road design, the Contractor shall ensure that the final design is reviewed by the qualified professional, and a statement which specifies the road by name, and statement indicating that the road design incorporates their recommendations is signed and sealed by the professional.

ARTICLE 5 ASSESSMENTS

Geotechnical Assessments

5.01 General Objectives

The Contractor shall provide detailed terrain stability assessments (TSFA) of proposed BC Timber Sales (BCTS) development areas where indicated in Schedule B-1. For roads, the Contractor shall assess the stability of proposed road locations and recommend specific measures to maintain slope stability, and to minimize surface erosion during and after road construction. For cutblocks the Contractor shall assess the proposed blocks in the context of both the engineered harvest system and the possibility of ground based harvesting with bladed or excavated trails. The final mapped terrain stability classes (L, M, H) shall be based on ground based harvesting.

Deliverables

- 5.02 The Contractor shall provide:
- a) a signed and sealed written report with content as specified in Article 5.04.
 - b) a review of final road designs with signature and seal as specified in Article 4.15.

Written Report Content

- 5.03 The following information shall be included as a minimum requirement for the written report:
- a) A CAD site map - 1:5,000 or 1:10,000 topographical showing cut block and road locations, chainages and traverse locations, soil pit locations (or other sub-surface observed exposures), other features of importance, detailed polygons with their respective terrain stability rating (L, M, H) and any recommended design changes.
 - b) For roads, observations shall be by chainage (relative to the P-line survey).
 - c) All reports shall include (where relevant) a description of the surficial material, the soil texture and depth, drainage class, active geological processes, bedrock type and structure (eg. strike and dip of bedding or fractures), landforms, topography, relevant groundwater and surface hydrology, creeks, gullies, outcrops, control points, indicative vegetation, existing instabilities, sideslopes, and other surface features.
 - d) Proximity of road/cutblock to other resource values (creeks, infrastructure, etc.)
 - e) For roads, adequacy of soil for subgrade/surfacing requirements.
 - f) The use of photographs and diagrams where appropriate.
 - c) For roads, detailed design, construction, and maintenance recommendations by chainage.
 - d) For cutblocks, detailed block design changes (if any).
 - h) Allowable waste areas (location and potential size) and design (where required) of waste areas.
 - i) Residual hazard (assuming recommendations are implemented), qualitative consequences (if known), and resulting risk (by chainage for roads).
 - j) Adequacy and discussion of all alternative road locations and road/cutblock designs explored.
 - k) Limitations of the investigation.
 - l) Recommendations for further work if required.
 - m) Identification of where qualified supervision, and professional construction confirmation are required.
 - n) Road deactivation considerations.
 - o) As applicable, recommend subsequent follow up by an alternate expert(s) proficient in particular conditions outside of assessor specialty.
 - p) For cutblocks with a moderate terrain hazard, a statement of whether or not bladed or excavated trails can be located, constructed, and rehabilitated in a manner that will not significantly increase the risk of landslides.
 - q) The professional's name and professional seal must be included in the report.

Required outline/format

- 5.04 The following summary table shall be included in the prescription report for roads that indicates by chainage the observations, recommendations, allowable waste sites, and residual hazards and risks. Table 2 is an example of the required summary table. The summary table can include drainage recommendations or a separate table can be created specifically for the drainage recommendations where necessitated by geotechnical concerns (see sample Table 3). For recommendations that are non-standard or that require more detail than that which can be provided in the table format, additional information shall be provided in the report to ensure that the prescription will be properly understood and interpreted.

Table 2 - Evaluation and Construction Recommendations
(Sample - add more detail as appropriate)

ROAD SECTION (from)	ROAD STATION (to)	SIDE SLOPE	OBSERVATIONS AND INTERPRETATIONS	SOIL	HYDROLOGY	RISK FACTORS	RECOMMENDED CONSTRUCTION SPECIFICATIONS	RES. HAZ	CONS.	RISK	MAX CUT SLP	MAX FILL SLP	EST. BEDROCK DEPTH

Table 3 Drainage Recommendations
(Sample - add more detail as appropriate)

STATION	UPSTREAM SLOPE (%)	DOWNSTREAM SLOPE (%)	GULLY DEPTH	FULL GULLY WIDTH	GULLY SIDESLOPES	FLOW (m ³ /s)	RECOMMENDED CULVERT SIZE (mm)	DESCRIPTION

Qualifications

- 5.05 Persons performing the services must have one of the following professional designations:
- Professional Geoscientist - registered with the Association of Professional Engineers and Geoscientists of BC (APEGBC)
 - Professional Engineer - registered with the APEGBC

Avalanche Risk Assessment**General Objectives**

- 5.06 The objective is to make recommendations on how the hazard or frequency of avalanches can be lowered on proposed BC Timber Sales development areas. Based upon field observations, the hazard class will be assessed, and recommendations shall be made regarding the location of block boundaries, and any other reasonable means which will reduce the hazard of a natural avalanche initiating from within the block, or reduce avalanche frequency and / or size.

Deliverables

Detailed Assessments

5.07 The following services are required for each location requiring a detailed assessment:

- a) office review
- b) field assessment
- c) submission of the final report.

Field Assessment

5.08 The Contractor shall spend sufficient time in the field to thoroughly assess all areas of concern for the indicated cutblock and make any required measurements. The assessment shall include, but is not limited to, a description of:

- a) any significant terrain features and their relation to the avalanche hazard, frequency and or size.
- b) all existing or potential trigger points within the proposed block boundaries.
- c) an assessment of the adequacy of the proposed boundaries, and identification of any modifications to be made to reduce either the hazard, frequency, and or size.

Written Report

5.09 The following information shall be included as a minimum requirement for the written report:

- a) a description of the physical elements affecting the avalanche hazard, frequency, and size in the area of concern.
- b) a written description of the recommended changes to the proposed layout of the block.
- c) any other recommendations concerning the proposed operation which will limit the frequency or lower the avalanche hazard.
- d) a map at 1:5000 detailing proposed changes to the block design (if any). The map must be to the standards in Article 2.08.

Qualifications

5.10 Persons performing the Avalanche Assessment services for this contract must have a minimum of five years experience in avalanche terrain hazard assessment and hold a Level II Canadian Avalanche Association certification.

Visual Impact Assessments

General

5.11 Where specified, the Contractor shall conduct a Visual Impact Assessment as per the methods outlined in the Visual Landscape Assessment Guidebook (2001). The Contractor shall produce a photorealistic digital terrain model equivalent or better than the quality produced by, "World Construction Set 4™", and which is capable of projecting block designs onto a forest cover planimetric map base.

5.12 The Ministry Representative will determine or provide viewpoint locations.

5.13 The Contractor shall GPS all viewpoint locations and determine viewing angles.

Deliverables

5.14 A digital and hardcopy DTM from viewpoints.

Fisheries Assessments

General

5.15 Where specified, the Contractor shall sample streams for fish presence using the methods recommended in the FPC Fish Stream Identification Guidebook. The Contractor shall use the "Systematic Sample Method" described in the guidebook and shall use electro-fishing as the primary sampling method.

5.16 The Contractor shall secure all required permits.

5.17 The Contractor shall use GPS to map all streams and reach breaks.

Deliverables

- 5.18 For all sampled streams, the Contractor shall complete a short written report (with accompanying map) to the standards detailed in the FPC Fish Stream Identification Guidebook and which is signed and sealed by a BC Registered Professional Biologist (R P Bio). The map must be to the standards in Article 2.08.

Qualifications

- 5.19 The Contractor must be able to obtain a Fish Collection Permit through the Ministry of Environment, Lands, and Parks (MOELP). All reach identification, stream sampling, and final stream classification shall be conducted under the guidance of a BC Registered Professional Biologist (R.P Bio). All electro fishing shall be conducted by persons trained and certified in its use.

Legal Land Survey

- 5.20 Where specified, the Contractor shall survey and confirm the boundaries of existing private lots to the standards of the BC Land Survey Act, and shall mark them to the standards listed below.

Deliverables

- 5.21 The Contractor shall clearly mark legal lot boundaries with wooden stakes (painted orange) no smaller than one (1) metre in length and spaced no further apart than twenty (20) metres. Stakes shall be firmly secured in the ground. Any corner post not clearly marked shall be marked with a steel pin no smaller than one (1) metre and painted orange. The contractor shall sign, seal and date a statement indicating that the boundary is surveyed to the standards of the BC Land Survey Act.

Qualifications

- 5.22 The work must be completed under the supervision of a registered BC Land Surveyor, or by a registered BC Land Surveyor, as defined by the BC Land Surveyor Act.

ARTICLE 6 INSPECTION AND ACCEPTANCE

Block and Road Layout

- 6.01 Further to Article 11.02 of the FS1000, the Contractor shall submit a written request (email is acceptable) for inspection of fieldwork associated with block and road layout prior to commencing cruising and assessment activities. The written request shall be accompanied by a map to the standards listed in Article 2.08.

Timber Cruising

- 6.02 The Contractor shall submit a written request (e-mail is acceptable) for inspection (check cruise) of all fieldwork associated with Timber Cruising. The written request shall be accompanied by data entry cards and a completed final cruise map showing all cruise plot locations, and all final strata.

ARTICLE 7 PENALTIES AND ASSESSMENTS

- 7.01 Notwithstanding the provisions of Article 13 (13.04 to 13.08) of the FS 1000, the Province may, at its sole discretion, impose a penalty on the Contractor as an alternative to terminating the Agreement in those circumstances where the Ministry Representative determines that the Contractor has failed to meet the Expected Completion Date specified in Schedule B-1 of this agreement.
- 7.02 Penalty for failure to meet the Expected Completion Date: For each day that the Contractor fails to complete the work specified in Schedule B-1 of this agreement, the Province may impose a penalty not exceeding five hundred dollars (\$500.00) per day.