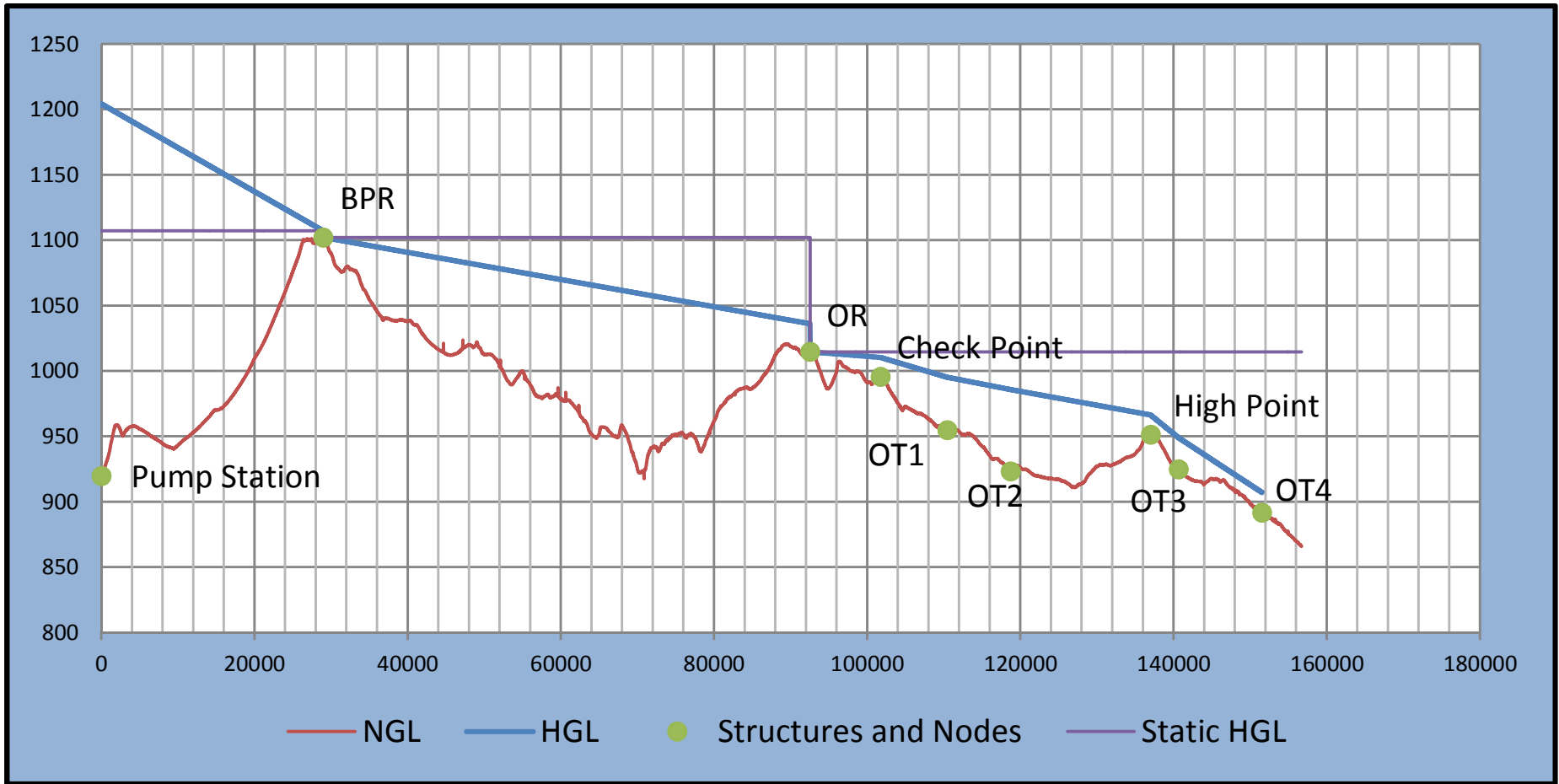


APPENDIX E

HYDRAULIC MODELS

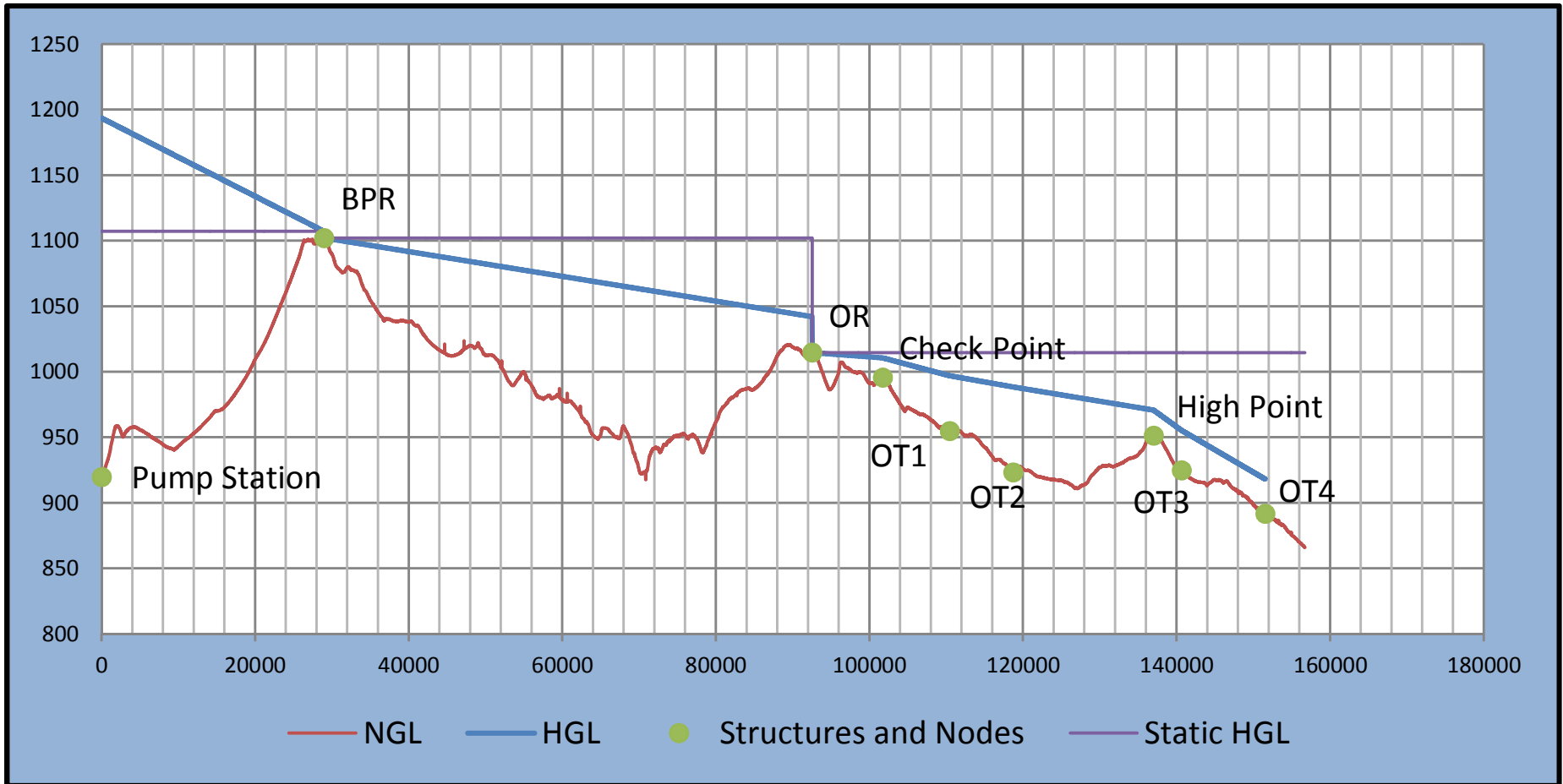
APPENDIX E1

OPTION V1



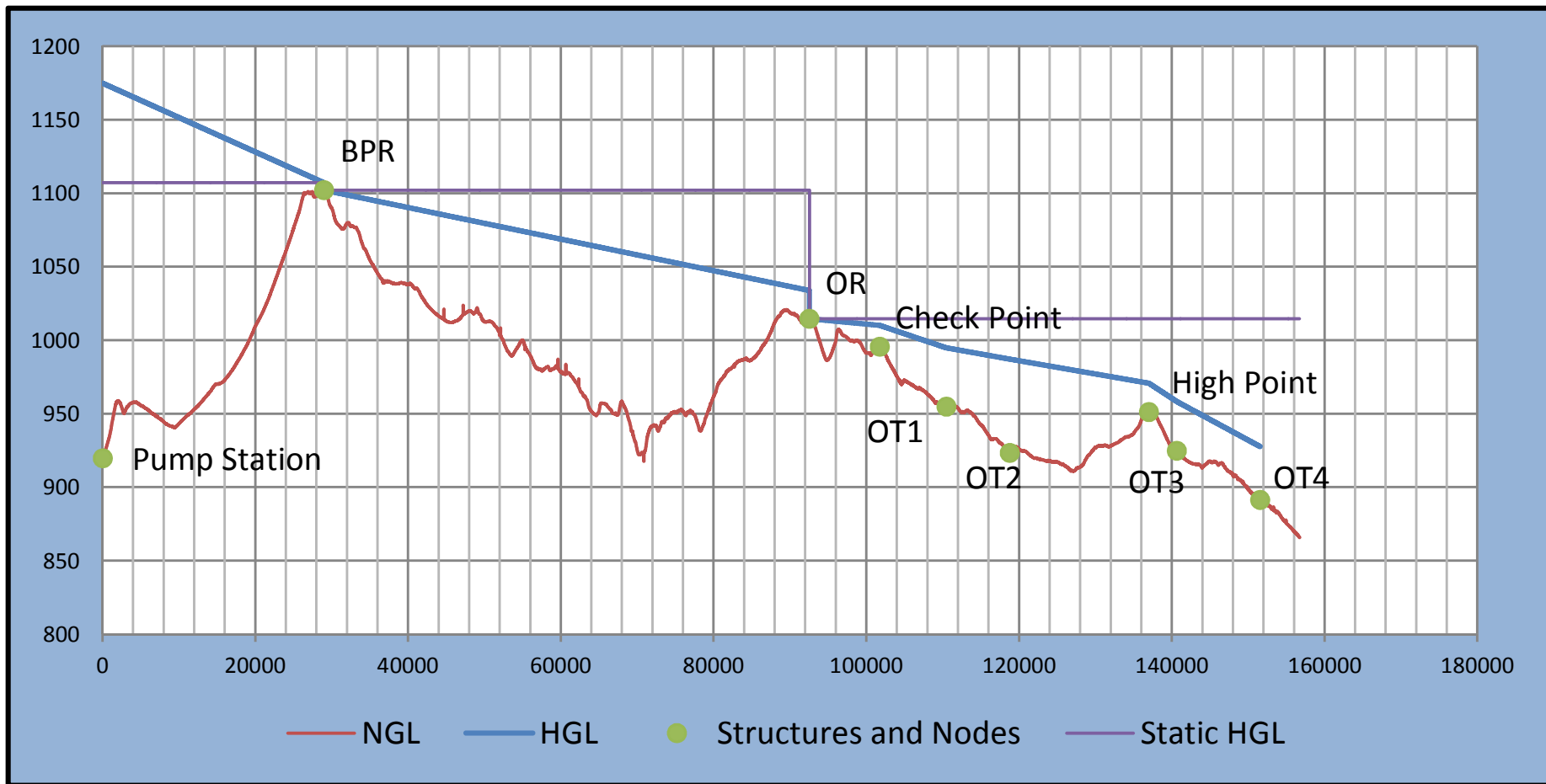
APPENDIX E2

OPTION V2



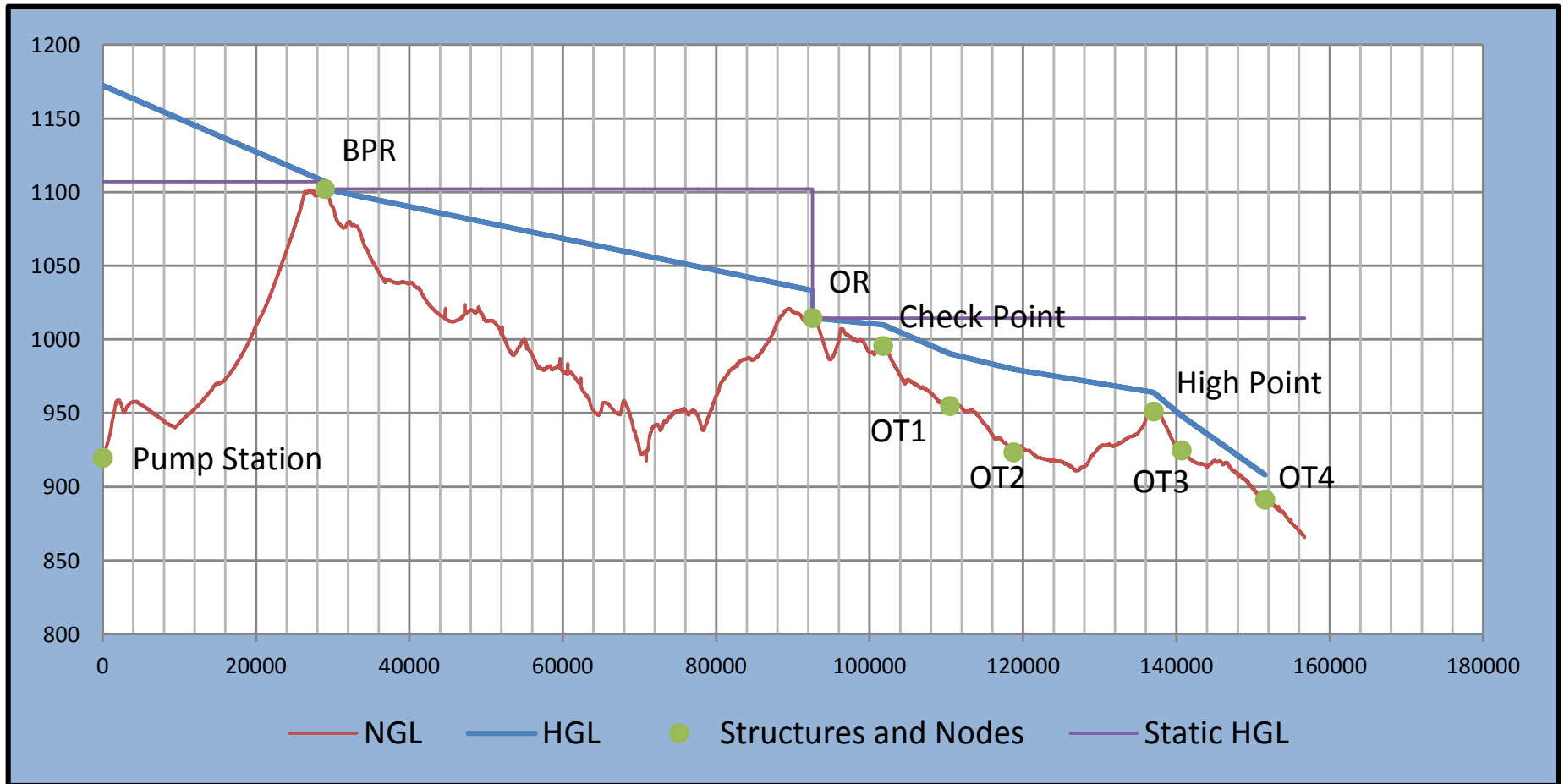
APPENDIX E3

OPTION W1



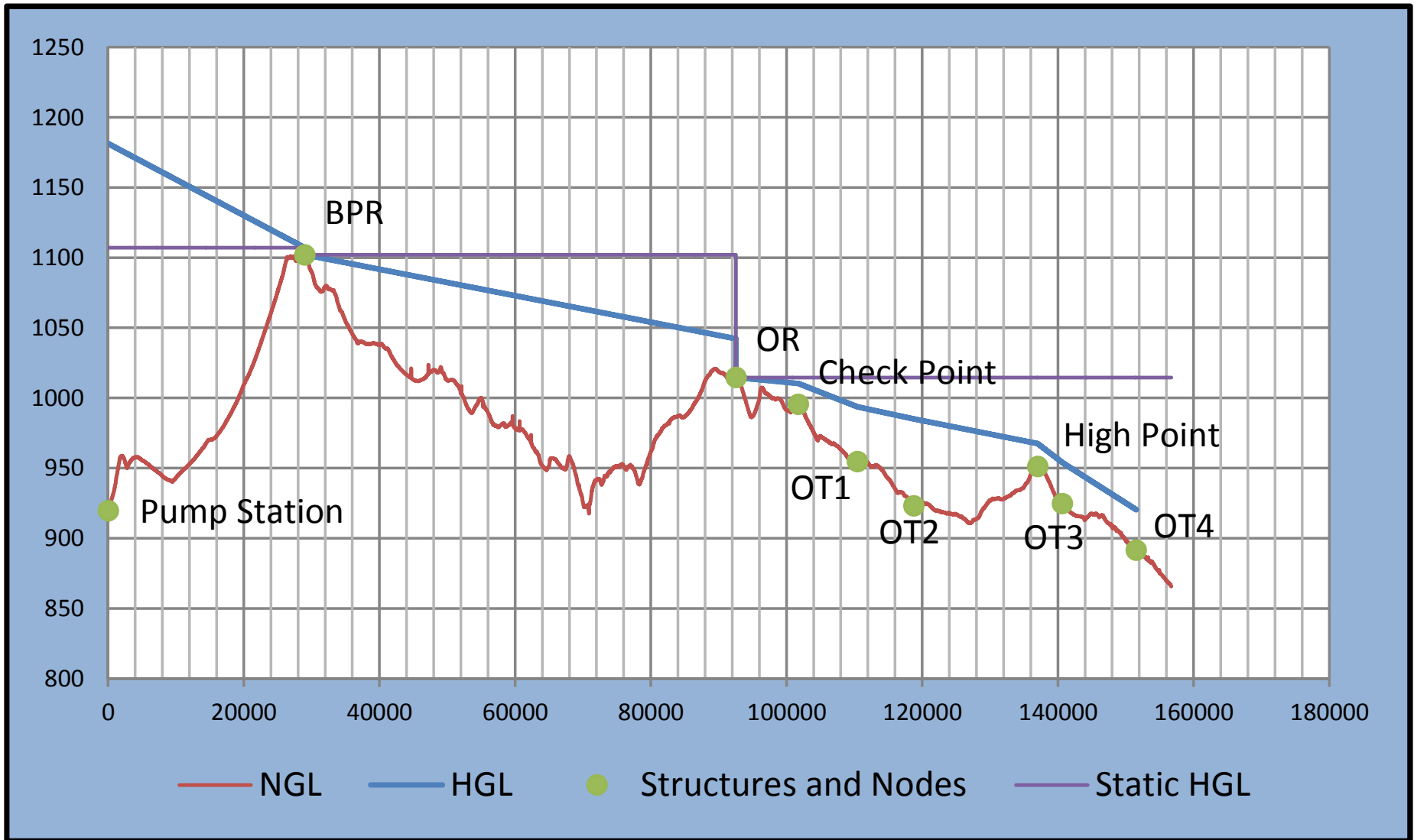
APPENDIX E4

OPTION X1



APPENDIX E5

OPTION X2



Route:	Western Route
Demand Scenario:	D1 (100 Mm ³ /a split to 4 off-takes)
System Configuration Option:	Pump to BPR, gravitate further
Date:	2015-09-04

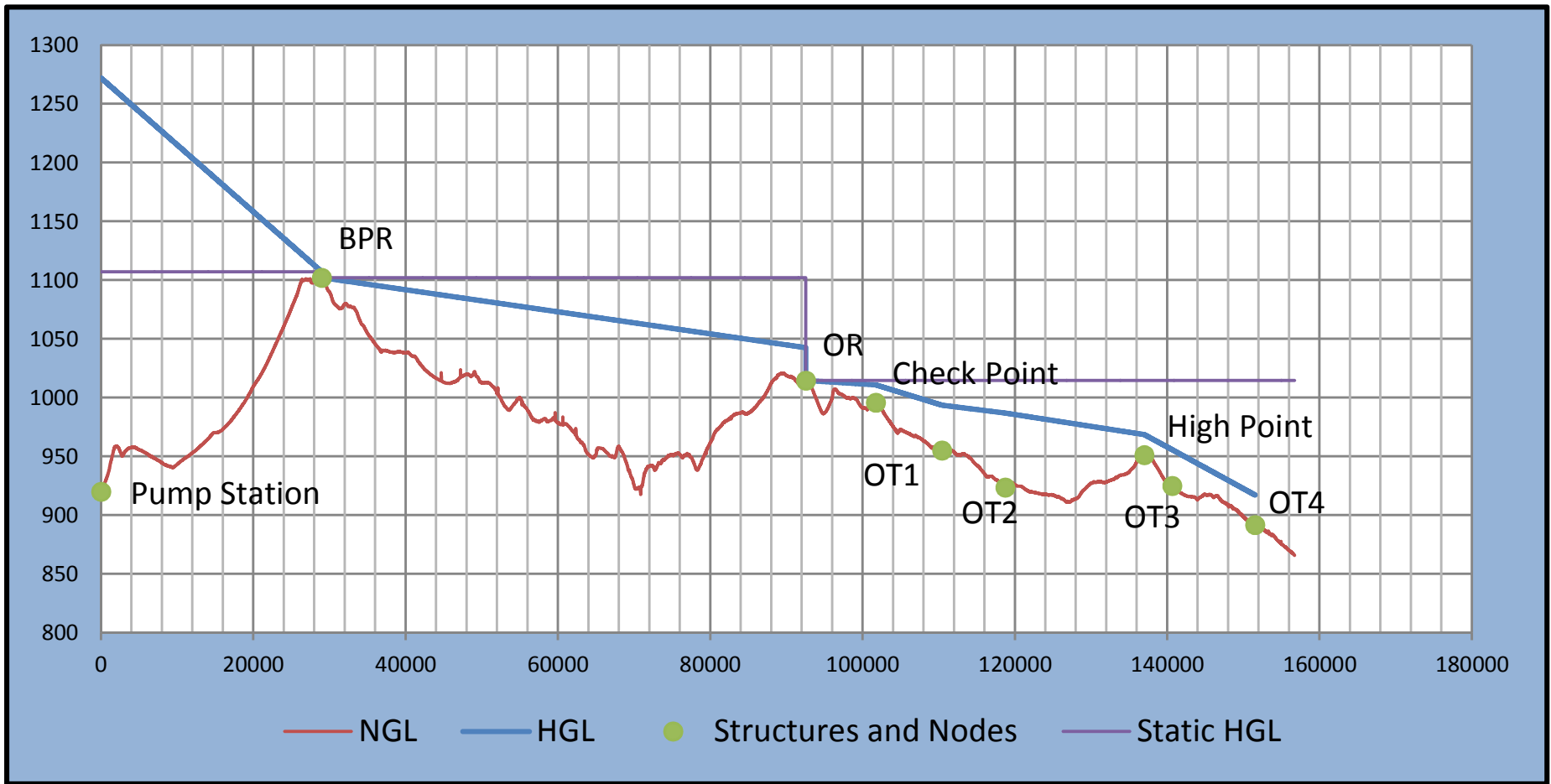


Input Cell
Cell does not meet one of the criteria

Structures and Nodes						Pipe Sections							Parameters and Constants			
Code	Structure Type	Chainage (m)	Elevation (masl)	Pressure Head (m)	Static Head (m)	#	Pipe Description	Diameter (m)	Start Chainage (m)	End Chainage (m)	Flowrate (m ³ /s)	Velocity (m/s)	Avg. Wall Thickness (mm)	Parameter	Value	Unit
ps	Pumpstation	0	919.834	261.462	187.254									Minor Losses	0.00025	m/m
BPR	Breakpressure	28988	1102.088	5.000	0.000	1	Rm 1 - ps to BPR	1.500	0	28988	4.122	2.333	10.013	Pump Station Losses	4	m
OR	Breakpressure	92557	1014.554	27.650	0.000	2	GF 1 - BPR to OR	1.900	28988	92557	4.122	1.454	11.875	Kinematic Viscosity	1E-06	
Checkpoint	Node	101764	995.670	14.629	18.884	3	GF 2 - OR to checkpoir	2.400	92557	101764	4.122	0.911	14.996	Pipe Roughness (k _s)	0.00015	m
Off-take 1	Node	110456	954.806	38.883	59.748	4	GF 3 - CP to OT1	1.600	101764	110456	4.122	2.050	10.003	Min. Residual Head	15	m
Off-take 2	Node	118760	923.336	61.723	91.218	5	GF 4 - OT1 to OT2	1.600	110456	118760	2.816	1.401	10.000	Max. Velocity	2.5	m/s
Highpoint	Node	137004	951.151	16.375	63.403	6	GF 5 - OT2 to HP	1.500	118760	137004	2.255	1.276	9.375	Max. Pump Head	350	m
Off-take 3	Node	140664	924.787	29.167	89.767	7	GF 6 - HP to OT3	1.100	137004	140664	2.255	2.373	6.883	Grade of Steel	300	Mpa
Off-take 4	Node	151564	891.496	28.844	123.058	8	GF 7 - OT3 to OT4	1.100	140664	151564	2.037	2.144	6.875	Stiffness Ratio (D/t)	160	mm/mm
						9								Stiffness Ratio (D/t)		
						10								Percentage of Yield	50%	

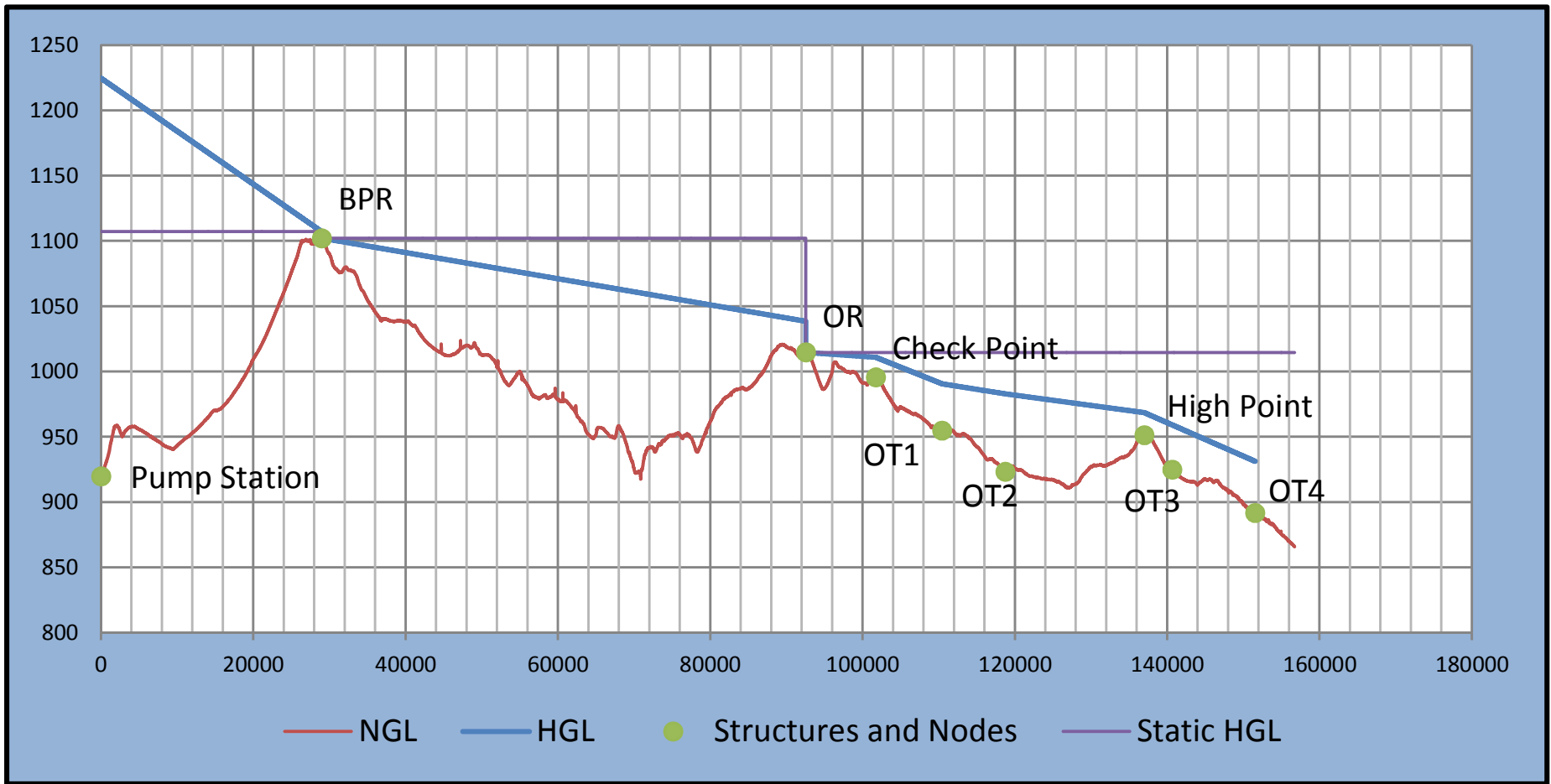
APPENDIX E6

OPTION Y1



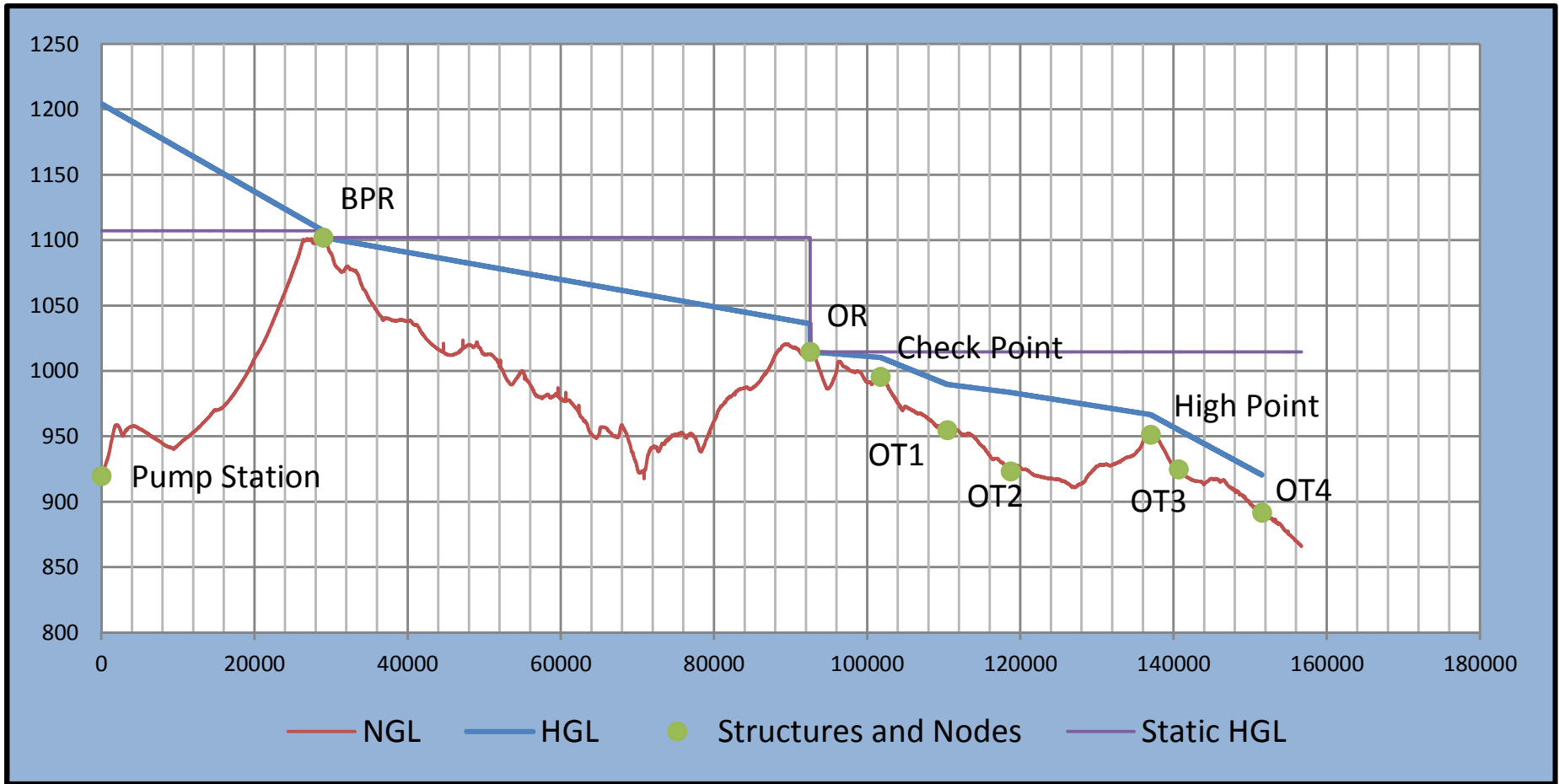
APPENDIX E7

OPTION Y2



APPENDIX E8

OPTION Z1



Route:	Western Route
Demand Scenario:	C4 (+80 Mm ³ /a split to 4 off-takes)
System Configuration Option:	Pump to BPR, gravitate further
Date:	2013-04-05



Input Cell
Cell does not meet one of the criteria

Structures and Nodes						Pipe Sections							Parameters and Constants			
Code	Structure Type	Chainage (m)	Elevation (masl)	Pressure Head (m)	Static Head (m)	#	Pipe Description	Diameter (m)	Start Chainage (m)	End Chainage (m)	Flowrate (m ³ /s)	Velocity (m/s)	Avg. Wall Thickness (mm)	Parameter	Value	Unit
ps	Pumpstation	0	919.834	284.382	187.254									Minor Losses	0.00025	m/m
BPR	Breakpressure	28988	1102.088	5.000	0.000	1	Rm 1 - ps to BPR	1.300	0	28988	3.298	2.485	9.033	Pump Station Losses	4	m
OR	Breakpressure	92557	1014.554	21.504	0.000	2	GF 1 - BPR to OR	1.700	28988	92557	3.298	1.453	10.625	Kinematic Viscosity	1E-06	
Checkpoint	Node	101764	995.670	14.613	18.884	3	GF 2 - OR to checkpoir	2.200	92557	101764	3.298	0.868	13.746	Pipe Roughness (k _s)	0.00015	m
Off-take 1	Node	110456	954.806	34.858	59.748	4	GF 3 - CP to OT1	1.400	101764	110456	3.298	2.142	8.753	Min. Residual Head	15	m
Off-take 2	Node	118760	923.336	60.153	91.218	5	GF 4 - OT1 to OT2	1.400	110456	118760	1.559	1.013	8.750	Max. Velocity	2.5	m/s
Highpoint	Node	137004	951.151	15.404	63.403	6	GF 5 - OT2 to HP	1.200	118760	137004	1.227	1.085	7.501	Max. Pump Head	350	m
Off-take 3	Node	140664	924.787	30.118	89.767	7	GF 6 - HP to OT3	0.900	137004	140664	1.227	1.929	5.631	Grade of Steel	300	Mpa
Off-take 4	Node	151564	891.496	28.932	123.058	8	GF 7 - OT3 to OT4	0.900	140664	151564	1.223	1.923	5.625	Stiffness Ratio (D/t)	160	mm/mm
						9								Stiffness Ratio (D/t)		
						10								Percentage of Yield	50%	

APPENDIX E9

OPTION Z2

