

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-1-1	KP 01+444	564664	7910499	6	0.606	0.365	1.601	1.5m culvert			40
CV-1-2	KP 01+501	564717	7910478	6			1.601	1.5m culvert			21
CV-2-1	KP 02+406	565499	7910058	7	0.471	0.301	1.339	1.5m culvert			31
CV-2-2	KP 02+754	565756	7909823	8	0.376	0.240	1.064	1.5m culvert			27
CV-3-1	KP 03+026	565972	7909658	9	1.016	0.601	2.658	1.5m culvert			31
CV-3-2	KP 03+892	566716	7909224	10	0.213	0.156	0.756	1.5m culvert			26
CV-4-1	KP 04+280	567005	7908966	11	3.118	1.388	6.678	3m culvert			43
CV-4-2	KP 04+537	567196	7908792	12	0.181	0.132	0.600	1.5m culvert	will require relocation		20
CV-4-3	KP 04+797	567388	7908618	13	0.140	0.101	0.443	1.5m culvert			28
CV-5-1	KP 05+171	567678	7908383	14	0.056	0.046	0.228	1.5m culvert			17
CV-5-2	KP 05+558	568021	7908203	15	0.279	0.202	0.908		joins CV-5-3 under subgrade		
CV-5-3	KP 05+578	568039	7908195	15				1.5m culvert			51
CV-6-1	KP 06+208	568606	7907921	17	3.644	1.586	7.610	2 x 3m culvert			19
CV-6-2	KP 06+363	568744	7907850	18	0.156	0.109	0.481	1.5m culvert			46
CV-6-3	KP 06+686	569014	7907674	20	1.219	0.638	3.011	1.5m culvert			64
CV-7-1	KP 07+062	569318	7907453	21	1.511	0.697	3.350	3m culvert			46
CV-7-2	KP 07+352	569564	7907300	22	0.063	0.051	0.227	1.5m culvert			44
CV-7-3	KP 07+551	569737	7907201	23	0.144	0.100	0.445	1.5m culvert			42
CV-8-1	KP 08+025	570136	7906946	24	2.615	1.157	5.588	3m culvert			49
BR-8-1	KP 08+811	570799	7906523	27	14.361	9.028	23.780	Short span bridge			
CV-8-2	KP 08+920	570888	7906461	28	0.188	0.135	0.600	1.5m culvert			44
CV-10-1	KP 10+742	572330	7905370	29	1.572	0.846	3.928	3m culvert			38
BR-11-1	KP 11+646	573099	7904907	30	52.751	25.232	61.480	Short span bridge		Yes	
CV-12-1	KP 12+583	574001	7904660	31	0.558	0.329	1.457	1.5m culvert			25
CV-12-2	KP 12+851	574236	7904530	32	0.467	0.288	1.268	1.5m culvert			38
CV-13-1	KP 13+709	574988	7904117	33	0.415	0.260	1.147	1.5m culvert			32
CV-13-2	KP 13+953	575210	7904017	34	0.742	0.462	2.047	1.5m culvert			21
CV-14-1	KP 14+305	575527	7903863	35	0.426	0.273	1.217	1.5m culvert			36
CV-14-2	KP 14+468	575666	7903777	36	0.308	0.193	0.853	1.5m culvert			57

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-14-3	KP 14+715	575878	7903651	37	1.652	0.940	4.259	3m culvert			57
CV-15-1	KP 15+850	576933	7903240	38	1.004	0.616	2.723	1.5m culvert			73
CV-16-1	KP 16+084	577142	7903135	39	0.015	0.017	0.079	1.5m culvert			76
CV-16-2	KP 16+391	577416	7902997	40	0.216	0.153	0.673	1.5m culvert			79
CV-17-1	KP 17+140	578074	7902639	41	1.936	1.168	5.139	3m culvert			88
CV-17-2	KP 17+891	578733	7902277	42	0.023	0.024	0.116	1.5m culvert			18
CV-18-1	KP 18+031	578855	7902210	43	2.455	1.122	5.393	4 x1.5m culvert			15
CV-18-2	KP 18+264	579063	7902106	44	0.112	0.082	0.371	1.5m culvert			27
CV-18-3	KP 18+579	579363	7902009	45	0.225	0.159	0.687	1.5m culvert			20
CV-19-1	KP 19+095	579874	7901941	46	2.901	1.462	7.054	2 x 3m culvert			173
CV-19-2	KP 19+682	580375	7901672	47	1.153	0.648	2.950	1.5m culvert			110
CV-20-1	KP 20+501	581148	7901424	48	0.460	0.290	1.287	1.5m culvert			129
CV-20-2	KP 20+680	581312	7901354	49	0.067	0.053	0.240	1.5m culvert			18
CV-21-1	KP 21+047	581661	7901241	50	1.563	0.878	4.004	3m culvert			197
CV-21-2	KP 21+986	582569	7901018	51	0.552	0.358	1.592	1.5m culvert			66
CV-22-1	KP 22+269	582846	7900965	52	0.135	0.097	0.434	1.5m culvert			29
CV-22-2	KP 22+486	583058	7900918	53	0.593	0.354	1.560	1.5m culvert			25
CV-22-3	KP 22+672	583241	7900890	54	1.027	0.597	2.670	1.5m culvert			54
CV-22-4	KP 22+820	583386	7900855	55	0.030	0.026	0.140	1.5m culvert			200
CV-22-5	KP 22+978	583535	7900806	56	0.189	0.135	0.598	1.5m culvert			252
CV-23-1	KP 23+491	584019	7900636	57	1.620	0.948	4.228	3m culvert			103
CV-24-1	KP 24+347	584837	7900385	58	0.360	0.258	1.122	1.5m culvert			110
CV-24-2	KP 24+829	585256	7900159	60	0.069	0.049	0.203	1.5m culvert			160
BR-25-1	KP 25+018	585397	7900034	61	113.074	46.084	107.260	Bridge		Yes	BR
CV-25-1	KP 25+584	585832	7899673	62	0.331	0.227	0.936	1.5m culvert			100
CV-25-2	KP 25+997	586177	7899452	63	1.425	0.741	3.530	3m culvert			31
CV-26-1	KP 26+779	586688	7898871	64	0.368	0.250	1.073	1.5m culvert			37

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-27-1	KP 27+282	587069	7898544	65	2.361	1.115	5.385	3m culvert			
				66	0.032	0.031	0.111	no structure specified	No apparent out flow. Requires detailed study		180
CV-27-2	KP 27+848	587483	7898170	67	7.964	5.666	15.460	3 x 3m culvert			62
CV-28-1	KP 28+287	587750	7897822	68	0.092	0.066	0.283	1.5m culvert			112
CV-28-2	KP 28+832	588069	7897382	69	0.149	0.106	0.454	1.5m culvert			82
CV-29-1	KP 29+637	588720	7896918	70	0.581	0.344	1.479	1.5m culvert	May require second structure		108
CV-30-1	KP 30+831	589396	7895937	71	0.358	0.232	0.921	1.5m culvert			40
BR-32-1	KP 32+258	590499	7895039	72	11.793	7.726	20.590	Short span bridge			102
CV-33-1	KP 33+689	591485	7894157	73	0.254	0.180	0.786	1.5m culvert			63
CV-34-1	KP 34+693	592112	7893466	74	0.451	0.310	1.349	1.5m culvert			175
CV-35-1	KP 35+055	592377	7893222	75	0.270	0.154	0.656	1.5m culvert	Crossings join at culvert inlet		133
				76	0.635	0.315	1.399				
BR-35-1	KP 35+825	592916	7892671	77	6087.513	1074.000	1968.100	Bridge		Yes	BR
CV-36-1	KP 36+070	593091	7892500	78	0.030	0.028	0.094	1.5m culvert			115
CV-36-2	KP 36+240	593231	7892404	78				1.5m culvert			178
CV-36-3	KP 36+623	593575	7892236	80	0.352	0.230	0.960	1.5m culvert			103
CV-37-1	KP 37+640	594279	7891573	81	0.122	0.089	0.357	1.5m culvert			96
CV-38-1	KP 38+994	594461	7890237	82	0.122	0.093	0.375	1.5m culvert			19
CV-39-1	KP 39+363	594631	7889909	83	0.251	0.181	0.708		redirect to CV-38-1 dykes required		CUT
CV-40-1	KP 40+083	595046	7889321	84	0.430	0.258	1.038	1.5m culvert			41
CV-40-2	KP 40+847	595487	7888698	85	0.137	0.099	0.386		redirect to CV-40-1 dykes required		CUT
CV-41-1	KP 41+480	595881	7888202	86	1.088	0.505	2.148	1.5m culvert			22
CV-42-1	KP 42+550	596485	7887328	87	0.716	0.384	1.560	1.5m culvert			16
CV-43-1	KP 43+151	596594	7886740	88	0.302	0.190	0.731	1.5m culvert			19
CV-43-2	KP 43+685	596576	7886207	89	0.125	0.092	0.362	1.5m culvert			12
CV-44-1	KP 44+090	596561	7885802	90	1.946	0.940	3.724	Pipe arch 3.1x2.0		Yes	17
CV-44-2	KP 44+390	596550	7885502	91	0.062	0.045	0.214	1.5m culvert	cut under embankment or evaluate 1 m culvert		10

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-44-3	KP 44+917	596551	7884976	92	2.168	0.760	3.281	Pipe arch 3.1x2.0		Yes	45
CV-45-1	KP 45+949	597159	7884188	93+94	2.658	1.117	4.488	3 x 1.5m culvert	relocated to KP 45+900		14
CV-47-1	KP 47+810	598223	7882688	95	0.045	0.034	0.152	no structure specified	Porous rock embankment		
CV-49-1	KP 49+114	597961	7881470	96	0.244	0.155	0.589	1.5m culvert			14
CV-49-2	KP 49+401	597790	7881238	97	0.744	0.367	1.603	1.5m culvert			20
CV-49-3	KP 49+974	597451	7880777	98	1.275	0.651	2.646	1.5m culvert			18
CV-50-1	KP 50+151	597346	7880635	99	0.084	0.062	0.239	1.5m culvert			24
CV-50-2	KP 50+841	596937	7880079	100	0.734	0.378	1.493	1.5m culvert			14
CV-51-1	KP 51+332	596682	7879662	101	0.143	0.107	0.411	1.5m culvert	cut under embankment or evaluate 1 m culvert		15
CV-51-2	KP 51+664	596622	7879337	102	6.982	5.107	14.050	3 x 3m culvert			17
CV-52-1	KP 52+543	596972	7878562	103	0.299	0.204	0.646	1.5m culvert			15
CV-52-2	KP 52+917	597276	7878344	104	6.304	4.711	13.080	2 x 3m culvert		Yes	52
CV-53-1	KP 53+411	597682	7878063	105	0.566	0.332	1.137	1.5m culvert			57
CV-56-1	KP 56+320	598812	7875711	106	0.359	0.242	0.899	1.5m culvert			102
CV-57-1	KP 57+590	599439	7874631	107	0.023	0.025	0.081	no structure specified	Porous rock embankment		
BR-57-1	KP 57+805.	599447	7874417	108	11.956	7.811	20.800	Short span bridge			
BR-59-1	KP 59+767.	598858	7872547	109+110	9.765	6.656	17.940	Short span bridge	Add flows from 109 and 110		
CV-60-1	KP 60+628	598646	7871712	111	0.669	0.409	1.517	1.5m culvert			23
CV-62-1	KP 62+886	598242	7869614	112	8.633	6.039	16.400	2 x 3m culvert		Yes	35
CV-63-1	KP 63+838	598618	7868739	113	2.019	0.797	3.285	3m culvert			19
CV-64-1	KP 64+820	599006	7867836	114	7.372	5.331	14.620	3 x 3m culvert			27
CV-65-1	KP 65+146	599134	7867537	115	0.119	0.087	0.306	1.5m culvert			31
CV-65-2	KP 65+421	599243	7867284	116	0.372	0.233	0.842	1.5m culvert	evaluate use of low pipe arch		17
CV-67-1	KP 67+078	600269	7866042	117	1.367	0.690	2.576	1.5m culvert	evaluate use of low pipe arch		16
CV-68-1	KP 68+073	601078	7865463	118	0.703	0.394	1.406	1.5m culvert			18
CV-69-1	KP 69+195	601904	7864757	119	0.242	0.171	0.611	1.5m culvert	May require second structure		18
CV-69-2	KP 69+640	602125	7864370	120	0.927	0.450	1.733	1.5m culvert			37
CV-71-1	KP 71+737	602564	7862400	121	2.876	1.333	6.127	3m culvert			33

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-73-1	KP 73+167	603092	7861082	122	4.606	1.973	9.120	2 x 3m culvert			15
CV-74-1	KP 74+585	603759	7859894	123	0.762	0.444	1.879	1.5m culvert	evaluate use of low pipe arch		12
CV-75-1	KP 75+144	603763	7859336	124	0.476	0.314	1.270	1.5m culvert			16
CV-75-2	KP 75+622	603944	7858901	125	2.459	1.079	5.047	3m culvert			13
CV-76-1	KP 76+013	604251	7858661	126	17.517	10.562	27.500	3 x Pipe arch 3.1x2.0		Yes	19
CV-76-2	KP 76+082	604309	7858624	126	17.517	10.562	27.500	3 x Pipe arch 3.1x2.0		Yes	14
CV-76-3	KP 76+185	604396	7858569	126	17.517	10.562	27.500	3 x Pipe arch 3.1x2.0		Yes	20
CV-77-1	KP 77+069	605007	7857943	NEW				1.5 culvert			27
CV-77-2	KP 77+202	605069	7857825	NEW				1.5 culvert			24
CV-78-1	KP 78+635	605518	7856472	127	20.819	12.105	31.190	2 x Pipe arch 4.4x2.9		Yes	93
CV-78-2	KP 78+874	605517	7856234	128	0.039	0.031	0.134	1.5m culvert			38
CV-78-3	KP 78+997	605514	7856111	129	0.355	0.234	0.988	1.5m culvert			26
CV-79-1	KP 79+228	605510	7855880	130+131	0.008	0.008	0.274	1.5m culvert	Add flows from 130 and 131		48
CV-79-2	KP 79+436	605517	7855672	132	0.045	0.041	0.149	1.5m culvert	cut under embankment		16
CV-79-3	KP 79+613	605523	7855495	133	0.752	0.390	1.805	1.5m culvert			207
CV-79-4	KP 79+980	605525	7855128	134	0.257	0.181	0.781	1.5m culvert			55
CV-80-1	KP 80+177	605520	7854931	135	0.384	0.223	0.983	1.5m culvert			51
CV-80-2	KP 80+420	605514	7854688	136	0.018	0.018	0.089	1.5m culvert			50
CV-80-3	KP 80+617	605509	7854492	137	1.149	0.593	2.768	1.5m culvert			28
CV-80-4	KP 80+663	605508	7854446	138	0.033	0.028	0.135	1.5m culvert			26
CV-80-5	KP 80+890	605503	7854219	139	0.024	0.022	0.106	1.5m culvert			16
CV-81-1	KP 81+015	605499	7854094	140	0.007	0.007	0.036	1.5m culvert			23
CV-81-2	KP 81+072	605498	7854036	141	0.082	0.057	0.249	1.5m culvert			38
CV-81-3	KP 81+164	605496	7853945	142	0.062	0.053	0.195	1.5m culvert			22
CV-81-4	KP 81+424	605504	7853686	143	0.077	0.062	0.248	1.5m culvert			30
CV-81-5	KP 81+778	605638	7853361	144	2.045	1.002	4.804	3m culvert			28
CV-81-6	KP 81+903	605718	7853264	145	0.028	0.023	0.101	1.5m culvert			33
CV-81-7	KP 81+979	605772	7853211	146	0.011	0.012	0.054	1.5m culvert			22
CV-82-1	KP 82+101	605860	7853126	147	0.057	0.046	0.204	1.5m culvert			31

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-82-2	KP 82+246	605964	7853026	148	0.638	0.333	1.574	1.5m culvert			38
CV-82-3	KP 82+379	606060	7852934	149	0.100	0.070	0.302	1.5m culvert			39
CV-82-4	KP 82+526	606166	7852831	150	0.079	0.059	0.268	1.5m culvert			28
CV-83-1	KP 83+070	606425	7852361	151	0.182	0.119	0.511	1.5m culvert	cut under embankment		194
CV-83-2	KP 83+158	606442	7852275	152	0.096	0.071	0.306	1.5m culvert			42
CV-83-3	KP 83+360	606450	7852073	153	0.833	0.414	1.975	1.5m culvert	Possibly redirect		17
CV-83-4	KP 83+791	606415	7851643	154	0.896	0.446	2.141	1.5m culvert			27
CV-84-1	KP 84+254	606386	7851181	155	2.077	0.914	4.453	3m culvert			40
CV-84-2	KP 84+450	606406	7850987	156	0.084	0.067	0.342		redirected to CV-84-1		20
CV-85-1	KP 85+135	606352	7850306	157	0.224	0.144	0.642	1.5m culvert			83
CV-85-2	KP 85+380	606381	7850063	158	0.456	0.284	1.260	1.5m culvert	Possibly redirect down slope		
CV-86-1	KP 86+606	606180	7848859	159	12.401	8.039	21.360	4 x 3m culvert	cut rock under alignment		15
BR-91-1	KP 91+840	605934	7843776	160	12.173	7.922	21.080	Short span bridge			
BR-92-1	KP 92+935	606356	7842767	161	16.391	10.021	26.190	Short span bridge			
CV-93-1	KP 93+266	606496	7842468	162	0.863	0.419	2.112	1.5m culvert	cut rock under alignment		14
CV-93-2	KP 93+561	606649	7842218	163	2.553	1.209	6.107	3m culvert	cut rock under alignment		13
BR-95-1	KP 95+525	607951	7840793	164	1569.197	368.110	731.680	Bridge		Yes	BR
BR-96-1	KP 96+363	608545	7840211	165	38.067	19.500	48.450	Short span bridge			
BR-96-2	KP 96+897	608708	7839705	166	30.738	16.469	41.450	Short span bridge			
CV-99-1	KP 99+261	608594	7837414	167	0.385	0.235	1.101	1.5m culvert	cut rock under alignment		22
BR-99-1	KP 99+541	608459	7837169	168	29.108	15.775	39.830	Short span bridge			
CV-101-1	KP 101+370	607062	7836041	169	0.793	0.489	2.286	1.5m culvert	cut rock under alignment		14
BR-105-1	KP 105+133	604165	7833828	170	29.508	15.946	40.230	Short span bridge			46
CV-105-1	KP 105+979	603377	7833541	171	0.373	0.214	1.000	1.5m culvert	cut rock under alignment		16
CV-107-1	KP 107+932	601557	7833054	172	0.851	0.457	2.210	1.5m culvert	cut rock under alignment		15
CV-109-1	KP 109+385	600761	7831883	173	0.291	0.176	0.824	1.5m culvert			29
CV-110-1	KP 110+797	599832	7830830	174	0.606	0.341	1.604	1.5m culvert	cut rock under alignment		21
CV-111-1	KP 111+797	599060	7830203	175	43.254	21.570	53.180	3 x 3m culvert	cut rock under alignment		21
CV-117-1	KP 117+370	597976	7825752	176	0.446	0.271	1.285	1.5m culvert			74

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-117-2	KP 117+663	598198	7825571	177	1.434	0.686	3.462	3m culvert			56
CV-117-3	KP 117+728	598230	7825513	178	2.246	1.121	5.625	3m culvert			39
CV-118-1	KP 118+018	598367	7825258								73
CV-118-2	KP 118+775	598603	7824545	179	1.443	0.760	3.717	3m culvert			28
CV-119-1	KP 119+037	598585	7824286	180	0.322	0.223	1.061	1.5m culvert			33
CV-119-2	KP 119+366	598535	7823963	181	0.316	0.211	0.988	1.5m culvert			21
CV-119-3	KP 119+967	598604	7823370	182	0.529	0.332	1.561	1.5m culvert			35
CV-120-1	KP 120+564	598639	7822779	183	0.674	0.426	1.996	1.5m culvert	cut rock under alignment		17
CV-121-1	KP 121+097	598596	7822248	184	0.347	0.235	1.095	1.5m culvert	cut rock under alignment		63
CV-121-2	KP 121+242	598571	7822105	NEW				1.5m culvert	cut rock under alignment		73
CV-121-3	KP 121+373	598549	7821976	NEW				1.5m culvert	cut rock under alignment		14
CV-121-4	KP 121+493	598523	7821859	185	0.393	0.255	1.196	1.5m culvert			36
CV-121-5	KP 121+974	598368	7821404	186	0.361	0.236	1.108	1.5m culvert			31
CV-123-1	KP 123+188	598386	7820275	188	0.089	0.074	0.439	1.5m culvert			55
CV-123-2	KP 123+348	598451	7820128	189	0.117	0.088	0.511	1.5m culvert			63
CV-123-3	KP 123+580	598478	7819899	190	14.647	9.169	24.120	3 x Pipe arch 3.9x2.7		Yes	15
CV-123-4	KP 123+811	598486	7819668	191	50.901	24.531	59.890	4 x Pipe arch 4.4x2.9		Yes	21
CV-123-5	KP 123+833	598486	7819646	191				1.5m culvert			26
CV-123-6	KP 123+866	598487	7819613	191				1.5m culvert			20
CV-123-7	KP 123+937	598490	7819542	191				1.5m culvert			14
CV-124-1	KP 124+085	598495	7819394	NEW				no structure specified	rock embankment		13
CV-124-2	KP 124+157	598497	7819322	192	0.010	0.009	0.039	no structure specified	rock embankment		19
CV-124-3	KP 124+267	598501	7819212	193	0.040	0.030	0.152	1.5m culvert			22
CV-124-4	KP 124+576	598499	7818904	194	0.219	0.144	0.678	1.5m culvert			27
CV-124-5	KP 124+916	598438	7818569	195	1.293	0.646	3.266	3m culvert			118
CV-125-1	KP 125+051	598396	7818441	196	0.011	0.010	0.058	1.5m culvert			67
CV-125-2	KP 125+137	598364	7818362	197	0.193	0.129	0.604	1.5m culvert			69
CV-125-3	KP 125+904	598388	7817669	198	0.237	0.146	0.692	1.5m culvert			26
CV-126-1	KP 126+217	598585	7817430	199	0.508	0.334	1.578	1.5m culvert			51

Table F6.1
Preliminary Assignment of Drainage Structures Along Railway

Structure Designation	KP	Eastern Coordinate (m)	Northern Coordinate (m)	Watershed Number	Catchment Area (km ²)	2 Year Flood (m ³ /s)	100 Year Flood (m ³ /s)	Design	Comments	Navigable	Culvert Length (m)
CV-127-1	KP 127+394	598533	7816272	200	0.019	0.018	0.061	1.5m culvert			16
CV-127-2	KP 127+835	598585	7815834	201	0.053	0.040	0.212	1.5m culvert			85
CV-129-1	KP 129+450	599372	7814493	202	2.888	1.106	5.809	3m culvert			25
CV-131-1	KP 131+695	600628	7812716	203	1.332	0.673	3.405	3m culvert			77
CV-133-1	KP 133+158	600977	7811319	205	0.153	0.106	0.499	1.5m culvert	dykes required upstream		64
CV-133-2	KP 133+951	600858	7810618	206	0.034	0.032	0.180	1.5m culvert			66
CV-134-1	KP 134+274	600609	7810415	207	2.133	0.941	4.815	3m culvert			26
CV-134-2	KP 134+453	600444	7810347	NEW				1.5m culvert			93
CV-134-3	KP 134+710	600192	7810294	208	0.057	0.042	0.214	1.5m culvert	under embankment		14
CV-136-1	KP 136+193	598958	7809569	209	1.434	0.720	3.667	3m culvert			33
CV-136-2	KP 136+843	598552	7809072	210	1.732	0.762	4.072	3m culvert			40
BR-137-1	KP 137+955	598663	7807981	211	308.128	101.740	222.970	Bridge		Yes	BR
CV-138-1	KP 138+991	598855	7806965	212	0.333	0.184	0.928	1.5m culvert			25
CV-140-1	KP 140+550	598138	7805589	213	0.070	0.050	0.260	1.5m culvert			16
BR-141-1	KP 141+390	597527	7805029	214	45.382	22.404	55.080	Short span bridge		Yes	
CV-142-1	KP 142+079	597201	7804426	215	0.209	0.128	0.611	1.5m culvert			31
CV-142-2	KP 142+731	596927	7803835	216	5.383	4.158	9.363	Pipe arch 3.1x2.0		Yes	132

Notes:

Pipe arch capacity:

3.100x1.981: Q=1.45 m³/s

3.730x2.290: Q=5.43 m³/s

3.890x2.690: Q=10.84 cub.m/s

4.370x2.870: Q=18.30 m³/s

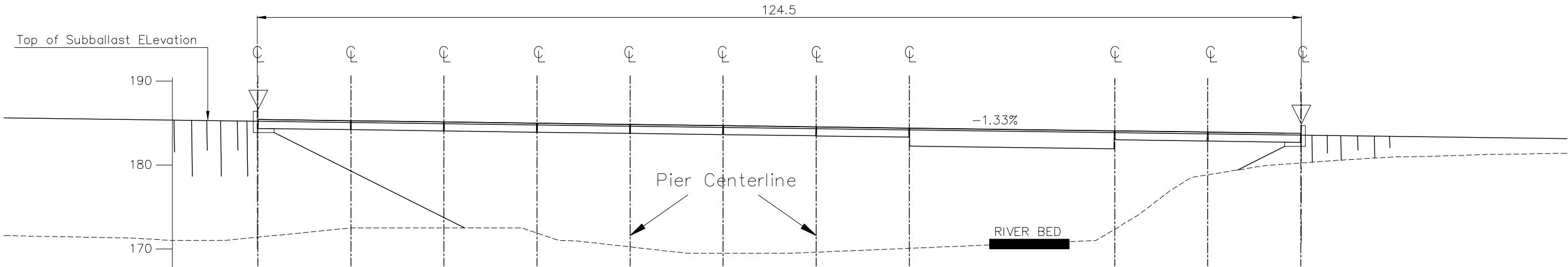
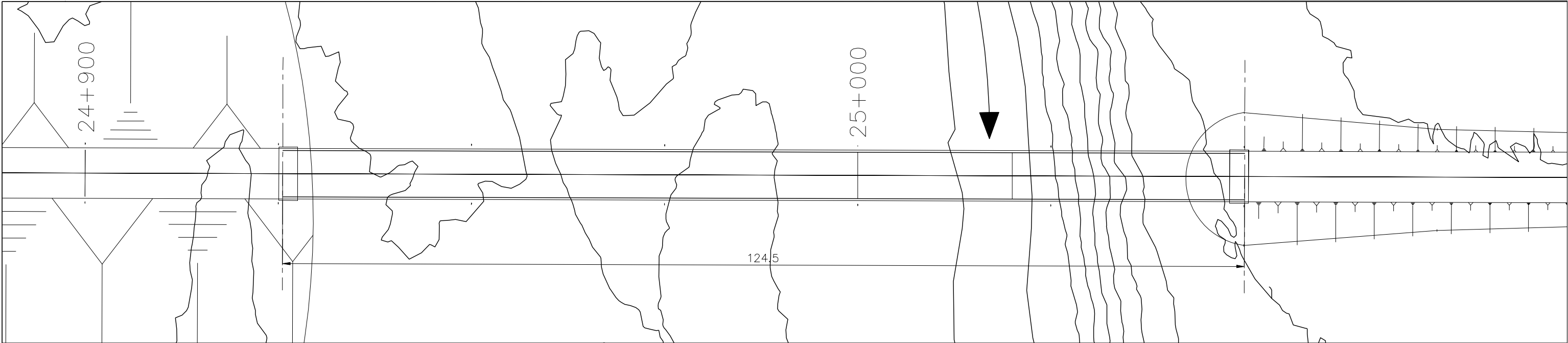
Round pipe culvert capacity:

1.5m: Q=1.56 m³/s

3m: Q= 9.9 m³/s

Table F6.2
Culverts Required Along Railway at Port and Mine Site

Alignment Structure designation	Alignment KP	Culvert length	Culvert Design	Amount of culverts	Remarks
PORT LOOP-CV-1-01	KP 01+235	20.6	1.5m	1	
PORT LOOP-CV-2-01	KP 02+856	99.3	3.0m	1	
PORT LOOP-CV-3-01	KP 03+505	47.5	1.5m	1	
PORT LOOP-CV-4-01	KP 04+112	19.3	1.5m	1	
PORT LOOP-CV-4-02	KP 04+327	97.4	1.5m	1	
PORT LOOP-CV-4-03	KP 04+629	15.1	1.5m	1	rock cut under alignmt
PORT LOOP-CV-5-01	KP 05+344	40.5	1.5m	1	rock cut under alignmt
PORT LOOP-CV-5-02	KP 05+761	25.8	1.5m	1	rock cut under alignmt
PORT LOOP-CV-6-01	KP 06+148	62.1	1.5m	1	rock cut under alignmt
PORT SERVICE-CV-0-01	KP 0+276	67.4	1.5m	1	
PORT SERVICE-CV-0-02	KP 0+585	63.8	1.5m	1	
PORT SERVICE-CV-1-01	KP 01+020	20.5	1.5m	1	
PORT SERVICE-CV-1-02	KP 01+650	9.0	1.5m	1	
PORT SERVICE-CV-2-01	KP 02+478	19.6	1.5m	1	
PORT TANK-CV-0-01	KP 0+135	20.0	1.5m	1	
PORT TANK-CV-0-02	KP 0+240	25.4	1.5m	1	
PORT YARD-CV-0-1	KP 0+400	16.5	1.5m	1	rock cut under alignmt
PORT YARD-CV-0-2	KP 0+676	14.3	1.5m	1	rock cut under alignmt
PORT WYE-CV-0-01	KP 0+184	52.0	1.5m	1	
MINE LOAD-CV-0-01	KP 0+185	29.7	1.5m	1	
MINE LOAD-CV-0-02	KP 0+257	36.7	1.5m	1	
MINE LOAD-CV-2-01	KP 02+295	35.0	1.5m	1	rock cut under alignmt
MINE LOAD-CV-2-02	KP 02+586	72.3	1.5m	1	rock cut under alignmt
MINE STORAGE-CV-0-01	KP 0+598	82.2	3.0m	2	



Top of rail Elevation (m)		KP24+920.00	185.913		KP24+940.00	185.653		KP24+960.00	185.383		KP24+980.00	185.123		KP25+000.00	184.853		KP25+020.00	184.583		KP25+040.00	184.323		KP25+060.00	184.053
Ground Elevation (m)		KP24+920.00	170.999		KP24+940.00	172.495		KP24+960.00	171.531		KP24+980.00	169.495		KP25+000.00	169.940		KP25+020.00	170.767		KP25+040.00	178.997		KP25+060.00	180.894
Chainage		KP24+920.00			KP24+940.00			KP24+960.00			KP24+980.00			KP25+000.00			KP25+020.00			KP25+040.00			KP25+060.00	

Notes:

1. See alignment drawings for detail of embankment.
2. Top of Rail Elevation = Top of Subballast Elevation +0.633
3. Foundation recommendations by others.

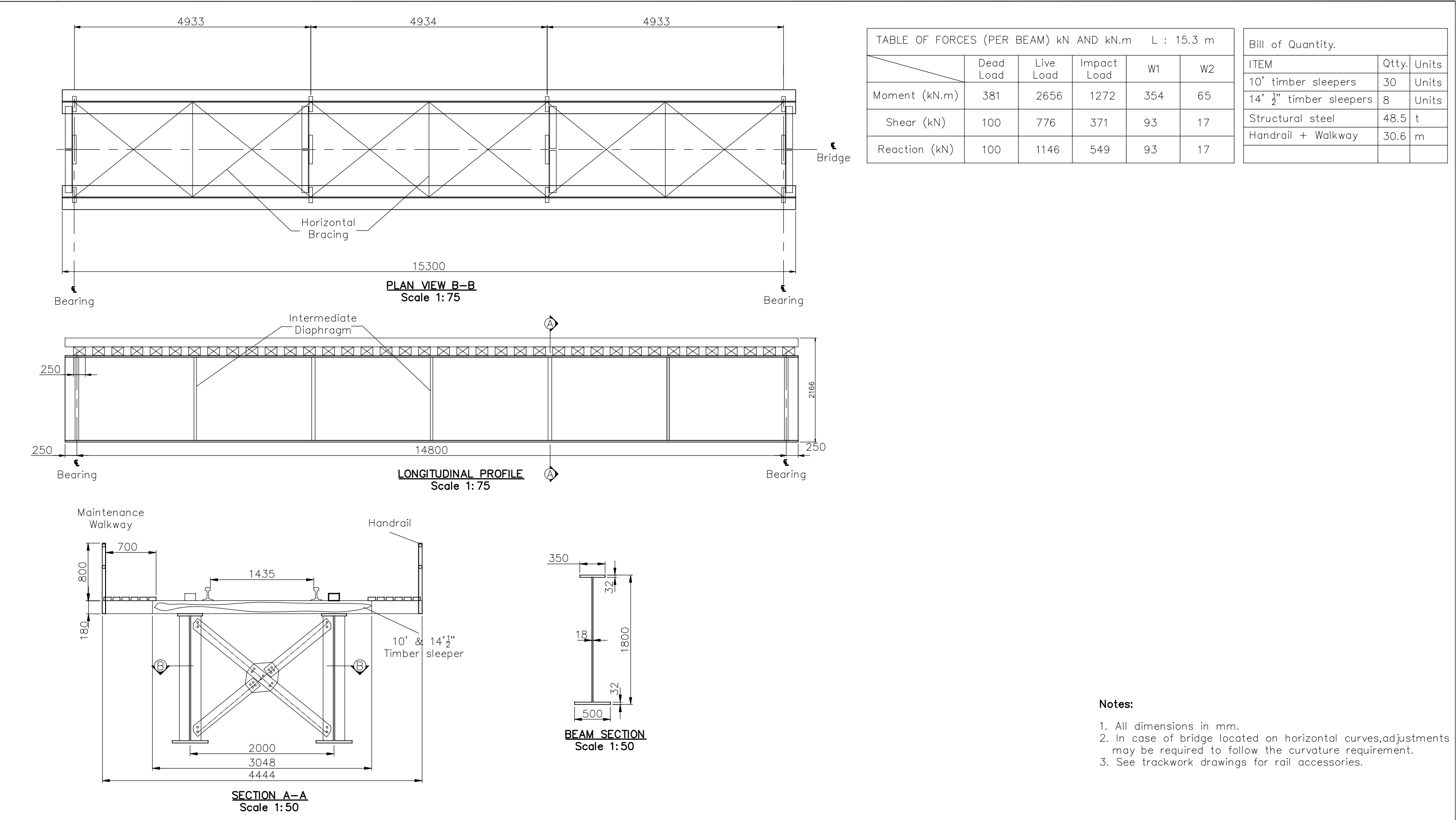
BR-25-1

Bridge Feature

Water Shed NO.	61
100 year flow	107.26 m ³ /s
Spans	7xRBD-11+1xDPG-24.4+2xRBD-11

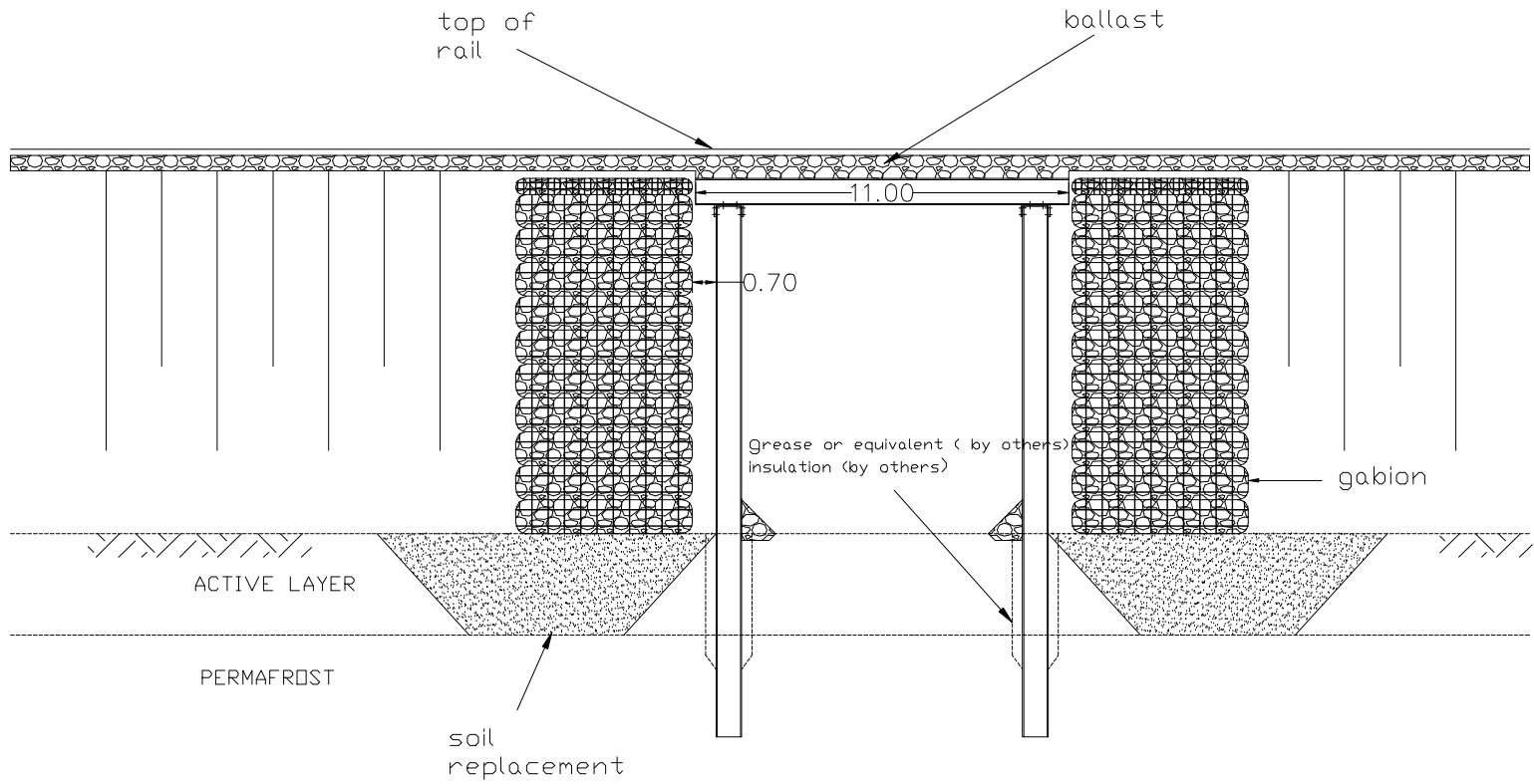
THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN

REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	ISSUE RECORD	CURRENT ISSUE FOR:			CLIENT 		AKER KVAERNER™ E&C Division			
							DESIGN	E.F.	12/02/2008	PROCESS				ISSUE	REV.	DATE			Toronto		Canada	
							DRAWN	L.Z.	12/02/2008	ENGINEERING				CLIENT APP'L					SCALE 1:500		PROJ No 179700	REV.
	3	MODIFIED	E.F.			12/02/2008	CHECKED			PROJECTS				QUOTATION					DRAWING No.		DWG—5000—BR—015	
	2	KILOMETER POINT CHANGED	E.F.				ACCEPTED			CLIENT				CONSTRUCTION							3	
	1	BRIDGE LOCATION AND CONFIGURATION MODIFIED	E.F.																			



THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN

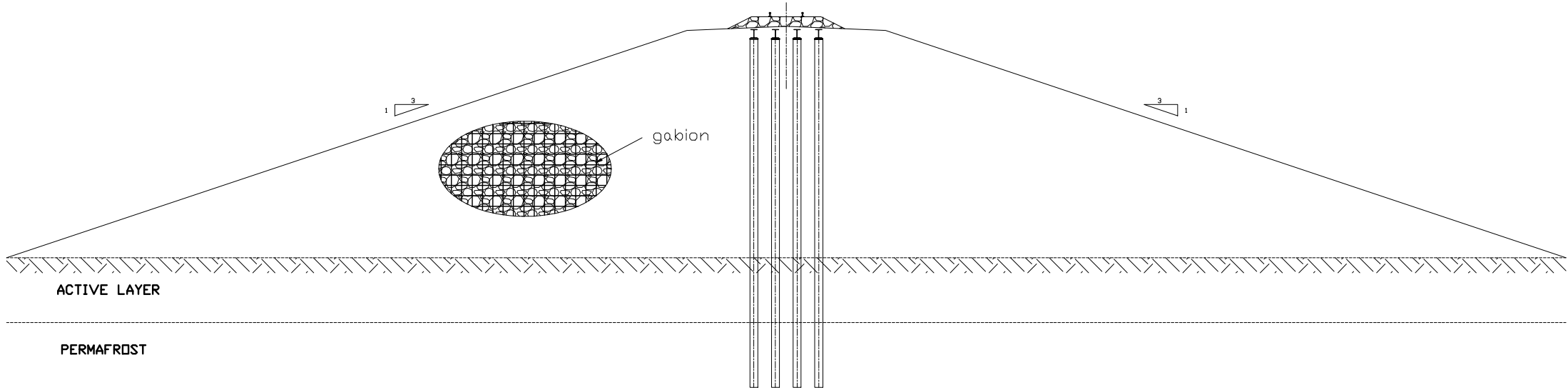
REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	CURRENT ISSUE FOR:			CLIENT  CANARAIL		AKER KVAERNER™ E&C Division TorontoCanada	
							DESIGN	E.F.	12/02/08	PROCESS			ISSUE	REV.	DATE				
							DRAWN	L.Z.	12/02/08	ENGINEERING			CLIENT APP'L						
							CHECKED			PROJECTS			QUOTATION						
							ACCEPTED			CLIENT			CONSTRUCTION						
	1	MODIFIED	E.F.				12/02/08												
														DRAWING No.		DWG-5000-BR-024		1	



1
BR-061

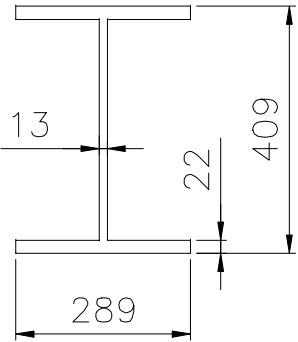
SECTION: A-A

Note:
Foundation details (spacing, dimension, insulation....) to be confirmed by others



2
BR-061

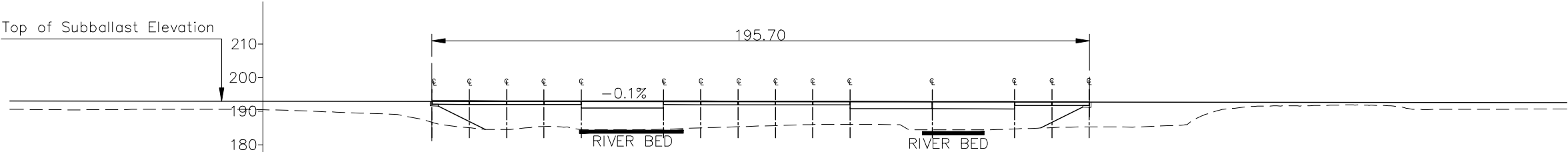
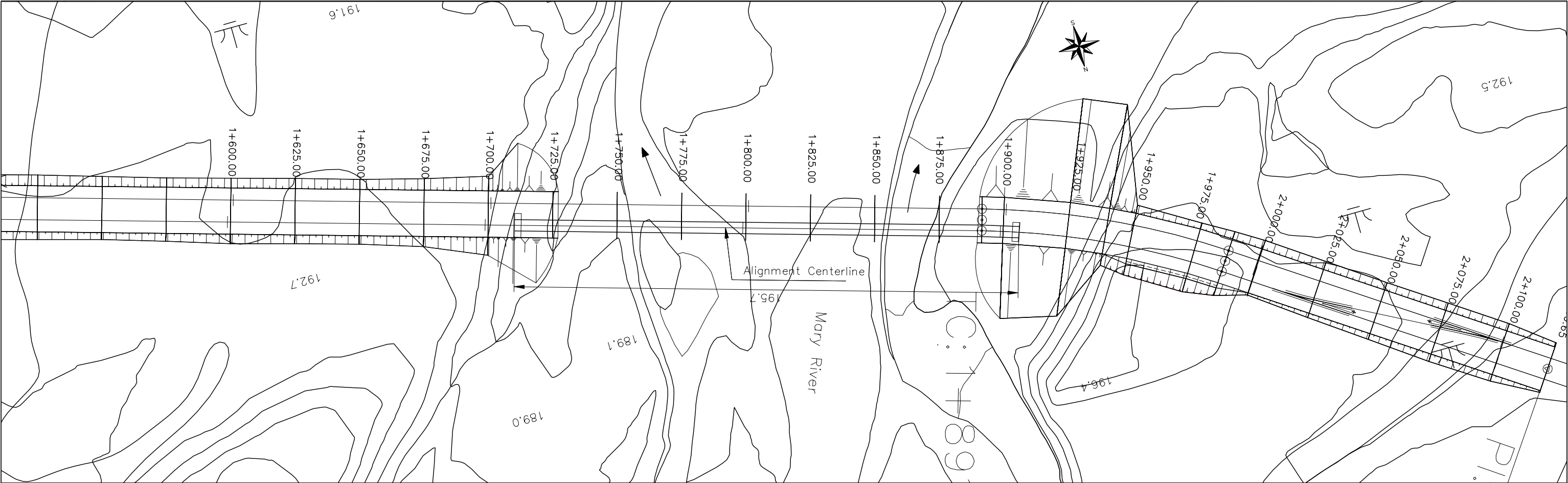
SECTION: B-B



ROLLED BEAM
SECTION FOR
VERTICAL MEMBER
UNIT:MM

THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN

REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	CURRENT ISSUE FOR:			CLIENT  CANARAIL		Toronto		Canada					
							DESIGN	E.F.	12/02/2008	PROCESS			ISSUE	REV.	DATE			PROJECT	TITLE	SHORT SPAN BRIDGE TYPICAL ELEVATIONS	SCALE	NO TO SCALE	PROJ No	179700	REV.
							DRAWN	L.X.	12/02/2008	ENGINEERING			CLIENT APP'L								MARY RIVER IRON ORE PROJECT	DRAWING No.	DWG-5000-BR-061	1	
							CHECKED			PROJECTS			QUOTATION												
							ACCEPTED			CLIENT			CONSTRUCTION												
	1	MODIFIED		E.F.			12/02/2008																		



Top of rail Elevation (m)																	
Ground Elevation (m)																	
Chainage	KP1+675.00	KP1+700.00	KP1+710.28	KP1+725.00	KP1+750.00	KP1+775.00	KP1+800.00	KP1+825.00	KP1+850.00	KP1+875.00	KP1+900.00	KP1+905.98	KP1+925.00				
	189.947	188.998	186.691	184.661	185.241	184.505	185.311	186.025	185.721	184.428	185.232	185.303	185.467				
	193.524	193.498	193.488	193.472	193.447	193.421	193.395	193.370	193.344	193.318	193.292	193.286	193.267				

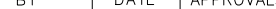
- Notes:
- 1. See alignment drawings for detail of embankment.
 - 2. Top of Rail Elevation = Top of Subballast Elevation + 0.63.
 - 3. Foundation recommendations by others.

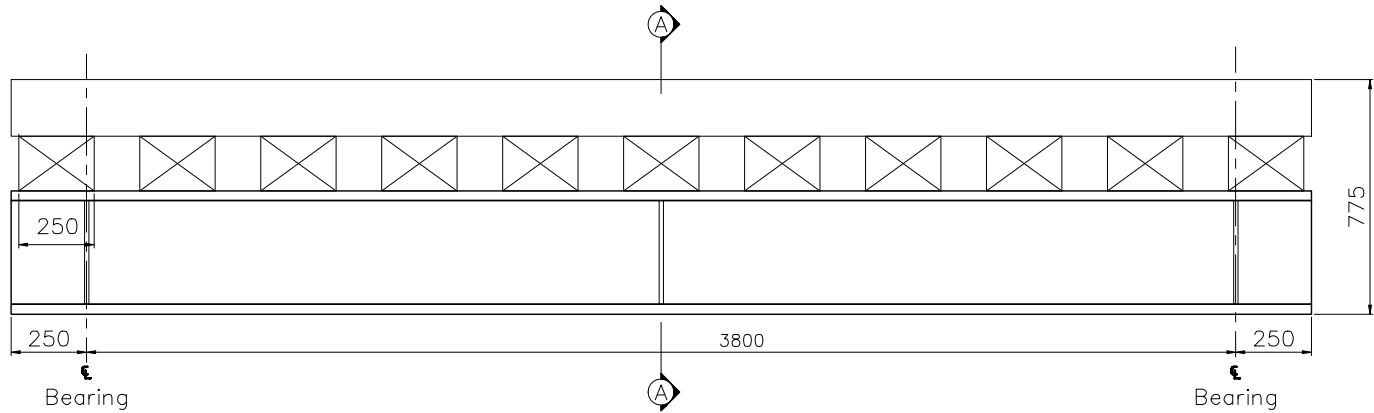
Bridge Feature

Water Shed NO.	N/A
100 year flow	190 m ³ /s
Spans	4xRBD-11+1xDPG-24.4+5xRBD-11+2xDPG-24.4+2xRBD-11

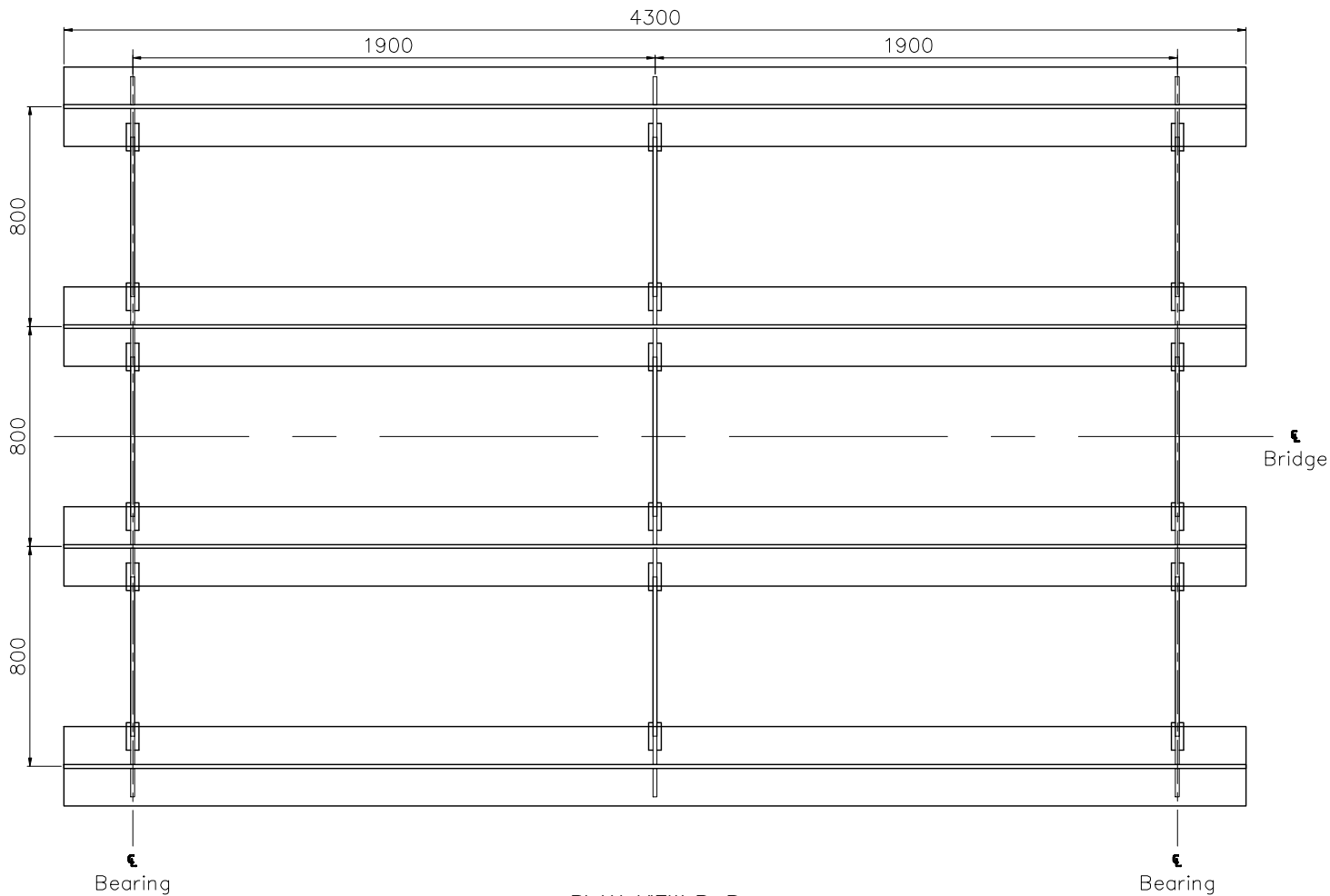
BR-MN-2

THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN

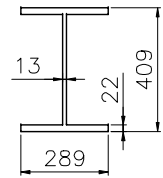
REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	ISSUE RECORD	CURRENT ISSUE FOR:			CLIENT  PROJECT MARY RIVER IRON ORE PROJECT	 TITLE BR-MN-2 LAYOUT SOUTH ROUTE GENERAL VIEW	Toronto		Canada	
							DESIGN	E.F.	12/02/2008	PROCESS				ISSUE	REV.	DATE			SCALE 1:1500	PROJ No 179700	REV.	
	3	MODIFIED	E.F.			12/02/2008	DRAWN	L.Z.	12/02/2008	ENGINEERING				CLIENT APP'L					DRAWING No.	DWG-5000-BR-012		
	2	KILOMETER POINT CHANGED	E.F.				CHECKED			PROJECTS				QUOTATION							3	
	1	LENGTH ADJUSTEMENT AND RENAME OF BRIDGE	E.F.				ACCEPTED			CLIENT				CONSTRUCTION								



LONGITUDINAL PROFILE



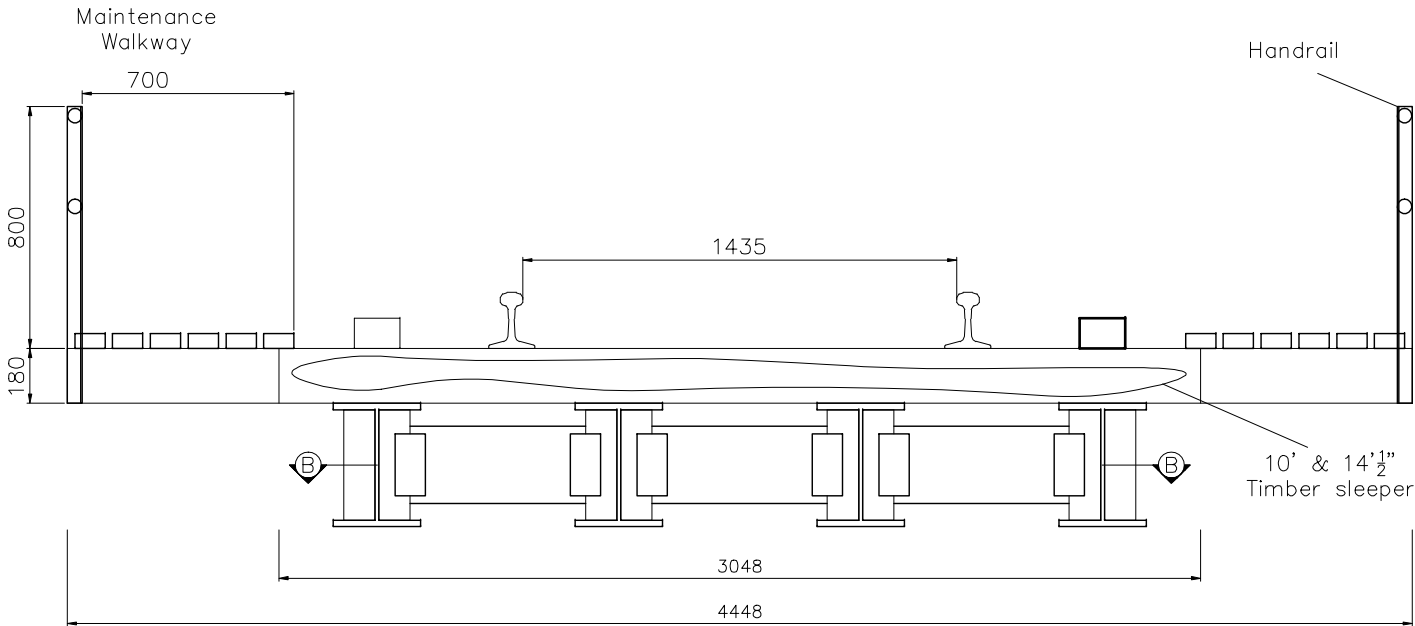
PLAN VIEW B-B



ROLLED BEAM SECTION

TABLE OF FORCES (PER BEAM) kN AND kN.m L : 4.3 m				
	Dead Load	Live Load	Impact Load	Fatigue Impact
Moment (kN.m)	5	163	90	60
Shear (kN)	5	206	109	72
Reaction (kN)	5	270	142	94

Bill of Quantity.		
ITEM	Qty.	Units
10' timber sleepers	8	Units
14' 1/2" timber sleepers	3	Units
Structural steel	0.76	t
Handrail + Walkway	8.6	m

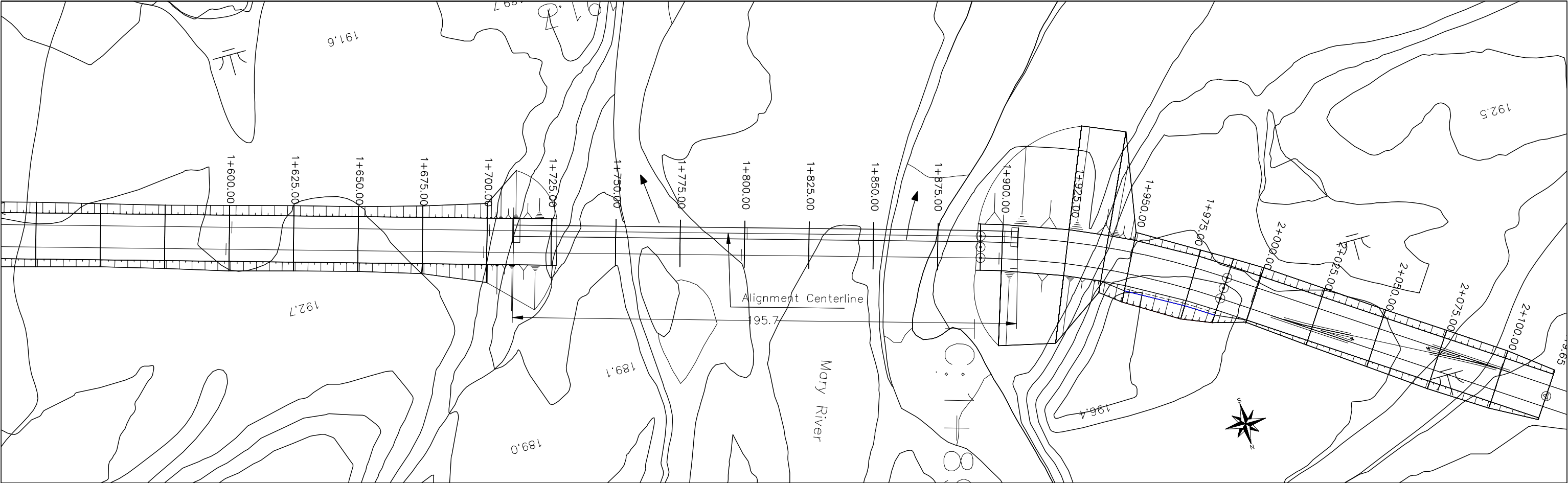


SECTION A-A

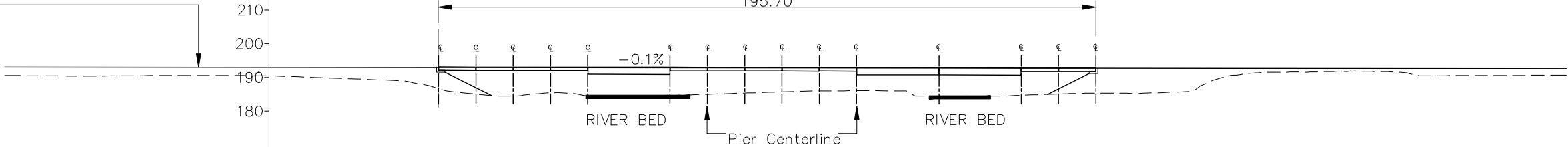
- Notes:
1. All dimensions in mm.
 2. In case of bridge located on horizontal curves, adjustments may be required to follow the curvature requirement.
 3. See trackwork drawings for rail accessories.

THIS DRAWING IS NOT VALID UNLESS THE LATEST REVISION INITIALS ARE HANDWRITTEN

REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	CURRENT ISSUE FOR:			CLIENT  	AKER KVAERNER™ E&C Division TorontoCanada					
							DESIGN	E.F.	12/02/2008	PROCESS			ISSUE	REV.	DATE		PROJECT MARY RIVER IRON ORE PROJECT	TITLE	ROLLED BEAM L=4.3 m OPEN DECK	SCALE 1:25	PROJ No 179700	REV.
							DRAWN	L.Z.	12/02/2008	ENGINEERING			CLIENT APP'L					DRAWING No.	DWG-5000-BR-020	1		
							CHECKED			PROJECTS			QUOTATION									
							ACCEPTED			CLIENT			CONSTRUCTION									
	1	MODIFIED	E.F.			12/02/2008																



Top of Subballast Elevation



Top of rail Elevation (m)	KP1+675.00193.524	KP1+700.00188.998	KP1+710.28186.691	KP1+725.00184.661	KP1+750.00185.241	KP1+775.00184.505	KP1+800.00185.311	KP1+825.00186.025	KP1+850.00185.721	KP1+875.00184.428	KP1+900.00185.232	KP1+905.98185.303	KP1+925.00185.467
Ground Elevation (m)	KP1+675.00189.947	KP1+700.00188.998	KP1+710.28186.691	KP1+725.00184.661	KP1+750.00185.241	KP1+775.00184.505	KP1+800.00185.311	KP1+825.00186.025	KP1+850.00185.721	KP1+875.00184.428	KP1+900.00185.232	KP1+905.98185.303	KP1+925.00185.467
Chainage	KP1+675.00	KP1+700.00	KP1+710.28	KP1+725.00	KP1+750.00	KP1+775.00	KP1+800.00	KP1+825.00	KP1+850.00	KP1+875.00	KP1+900.00	KP1+905.98	KP1+925.00

Notes:

1. See alignment drawings for detail of embankment.
2. Top of Rail Elevation = Top of Subballast Elevation + 0.63.
3. Foundation recommendations by others.

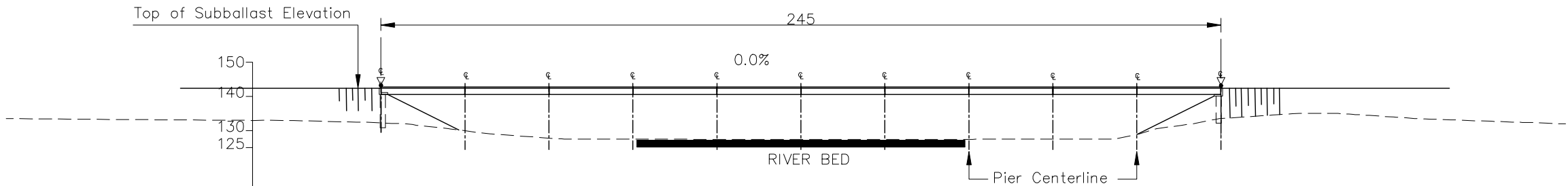
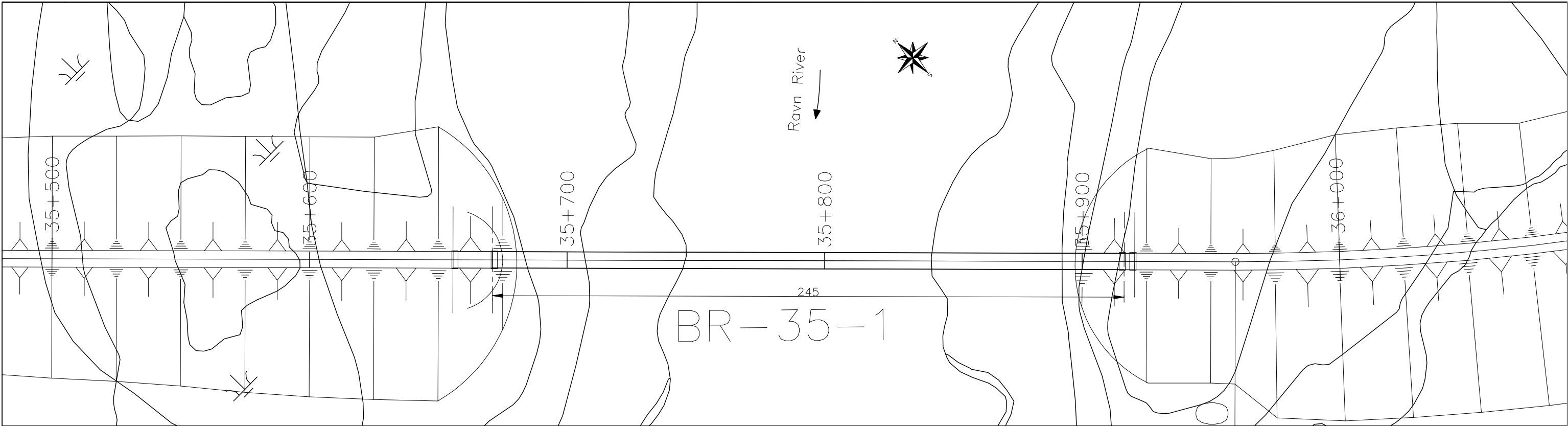
Bridge Feature

Water Shed NO.	N/A
100 year flow	190 m ³ /s
Spans	4xRBD-11+1xDPG-24.4+5xRBD-11+2xDPG-24.4+2xRBD-11

BR-MN-1

THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN

REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	ISSUE RECORD	CURRENT ISSUE FOR:			CLIENT  PROJECT MARY RIVER IRON ORE PROJECT	 TITLE BR-MN-1 LAYOUT SOUTH ROUTE GENERAL VIEW	Toronto		Canada	
							DESIGN	E.F.	12/02/2008	PROCESS				ISSUE	REV.	DATE			SCALE 1:1500	PROJ No 179700	REV.	
	3	LOAD TRACK UPDATED	E.F.			12/02/2008	DRAWN	L.Z.	12/02/2008	ENGINEERING				CLIENT APP'L					DRAWING No.		3	
	2	KILOMETER POINT CHANGED	E.F.				CHECKED			PROJECTS				QUOTATION					DWG-5000-BR-011			
	1	LENGTH ADJUSTMENT AND RENAME OF BRIDGE	E.F.				ACCEPTED			CLIENT				CONSTRUCTION								
														PROJECT					MARY RIVER IRON ORE PROJECT			



Top of rail Elevation (m)		143.123		143.123		143.123		143.123		143.123		143.123		143.123		143.123		143.123		143.123		143.123		143.123		143.123		143.123
Ground Elevation (m)		132.801		129.381		127.472		127.418		127.464		127.464		127.464		130.904		130.904		135.000		135.000		135.000		135.000		135.000
Chainage		KP35+650.00		KP35+700.00		KP35+750.00		KP35+800.00		KP35+850.00		KP35+850.00		KP35+850.00		KP35+900.00		KP35+900.00		KP35+950.00		KP35+950.00		KP35+950.00		KP35+950.00		KP35+950.00

Bridge Feature

Water Shed NO.	76
100 year flow	1968.1 m ³ /s
Spans	10xDPG-24.4

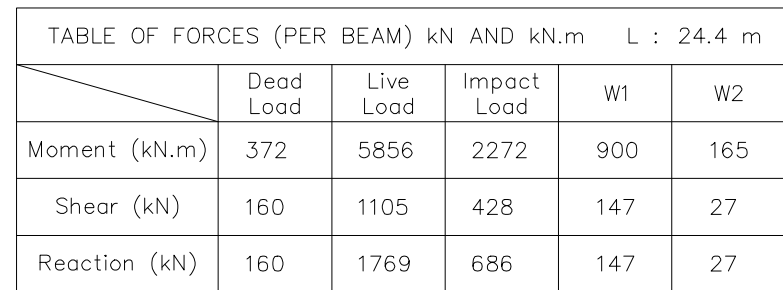
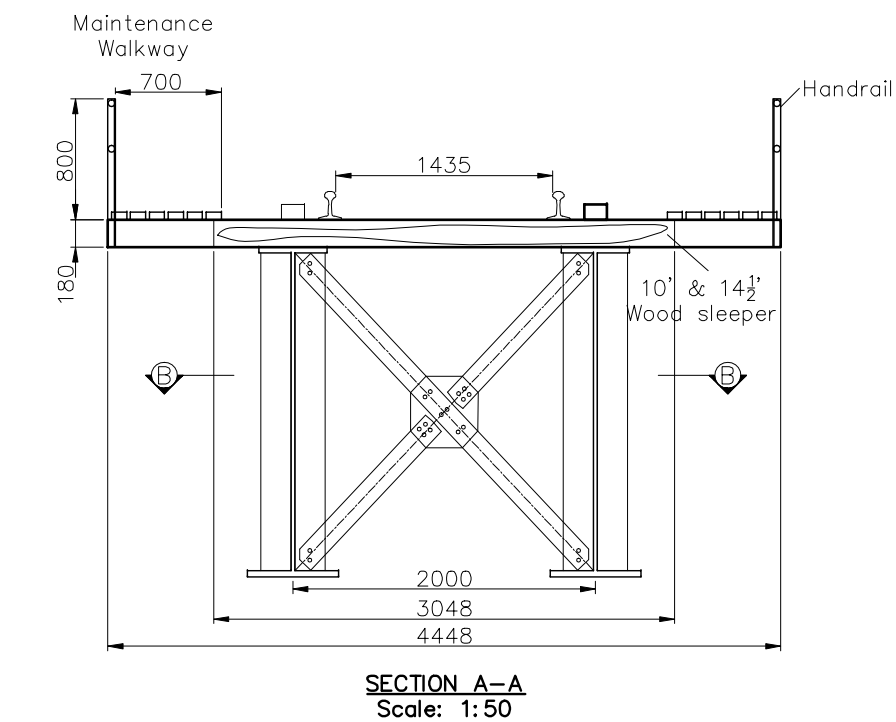
BR-35-1

Notes:

1. See alignment drawings for detail of embankment.
2. Top of Rail Elevation = Top of Subballast Elevation +0.633
3. Foundation recommendations by others.

THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN

REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	ISSUE RECORD	CURRENT ISSUE FOR:			CLIENT 		AKER KVAERNER™					
															E&C Division									
							DESIGN	E.F.	12/02/2008	PROCESS						Toronto			Canada					
	3	TITLE MODIFIED	E.F.			12/02/2008	DRAWN	L.Z.	12/02/2008	ENGINEERING					ISSUE	REV.			DATE	PROJECT MARY RIVER IRON ORE PROJECT	TITLE BR-35-1 LAYOUT SOUTH ROUTE GENERAL VIEW	SCALE 1:1500	PROJ No 179700	REV.
	2	KILOMETER POINT CHANGED	E.F.				CHECKED			PROJECTS					CLIENT APP'L							DRAWING No.	DWG-5000-BR-013	3
							ACCEPTED			CLIENT					QUOTATION									
	1	SPAN TYPE REVISED TO 24.4 M	E.F.													CONSTRUCTION								

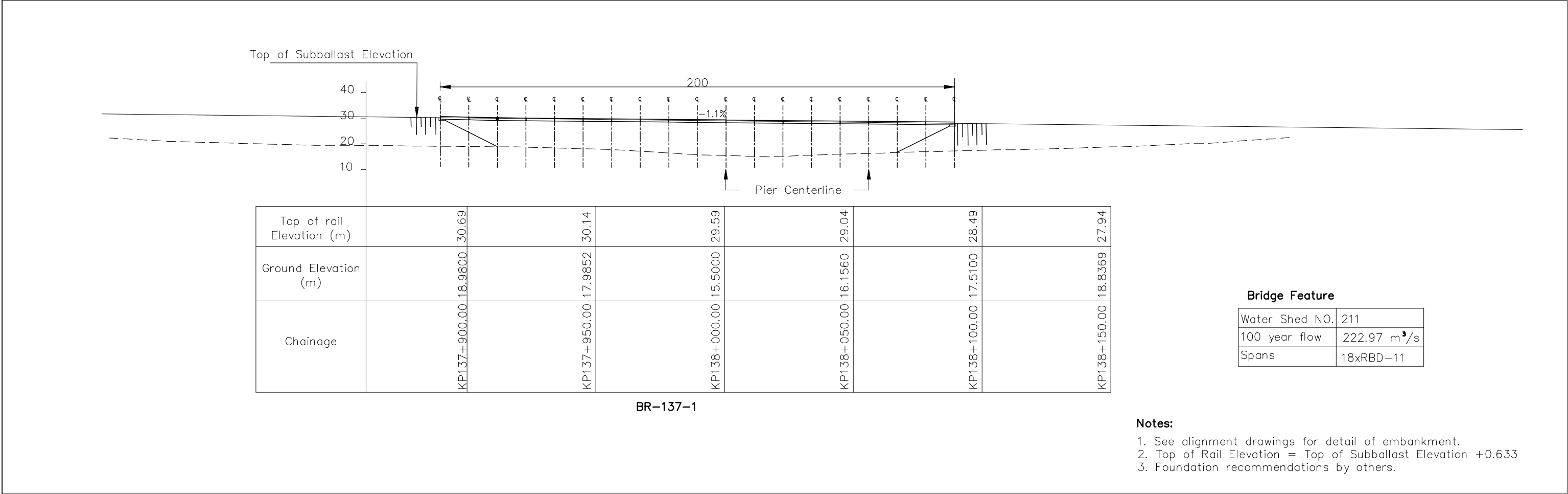
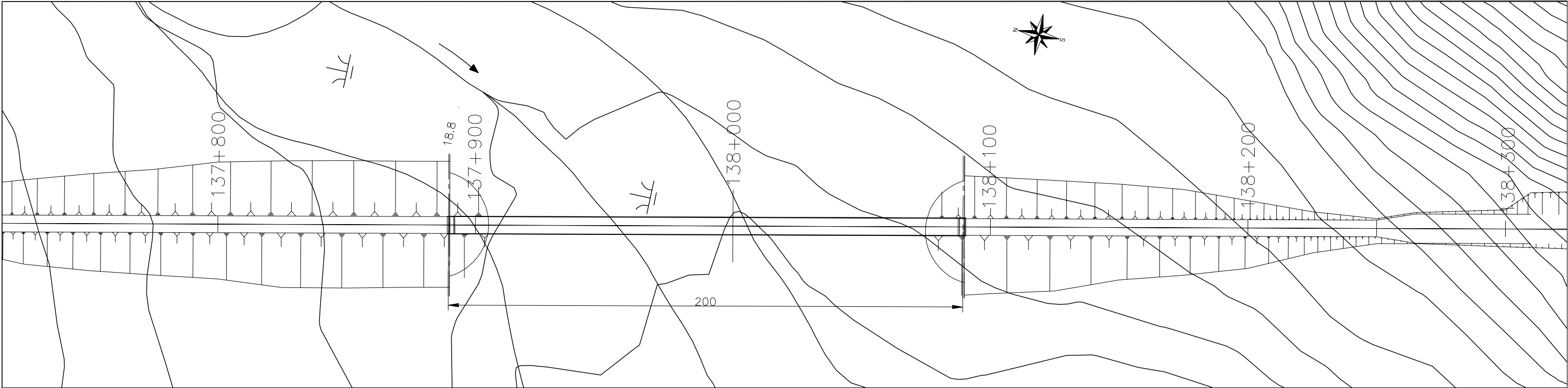


Bill of Quantity.		
ITEM	Qty.	Units
10' Timber sleepers	48	Units
14' $\frac{1}{2}$ " Timber sleepers	13	Units
Misc. structural steel	77.4	t
Handrail + Walkway	48.8	m

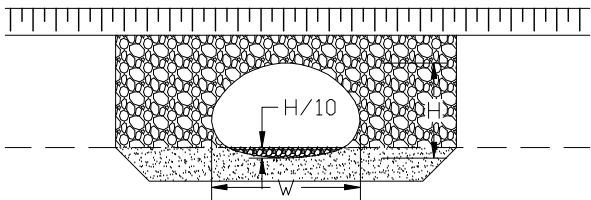
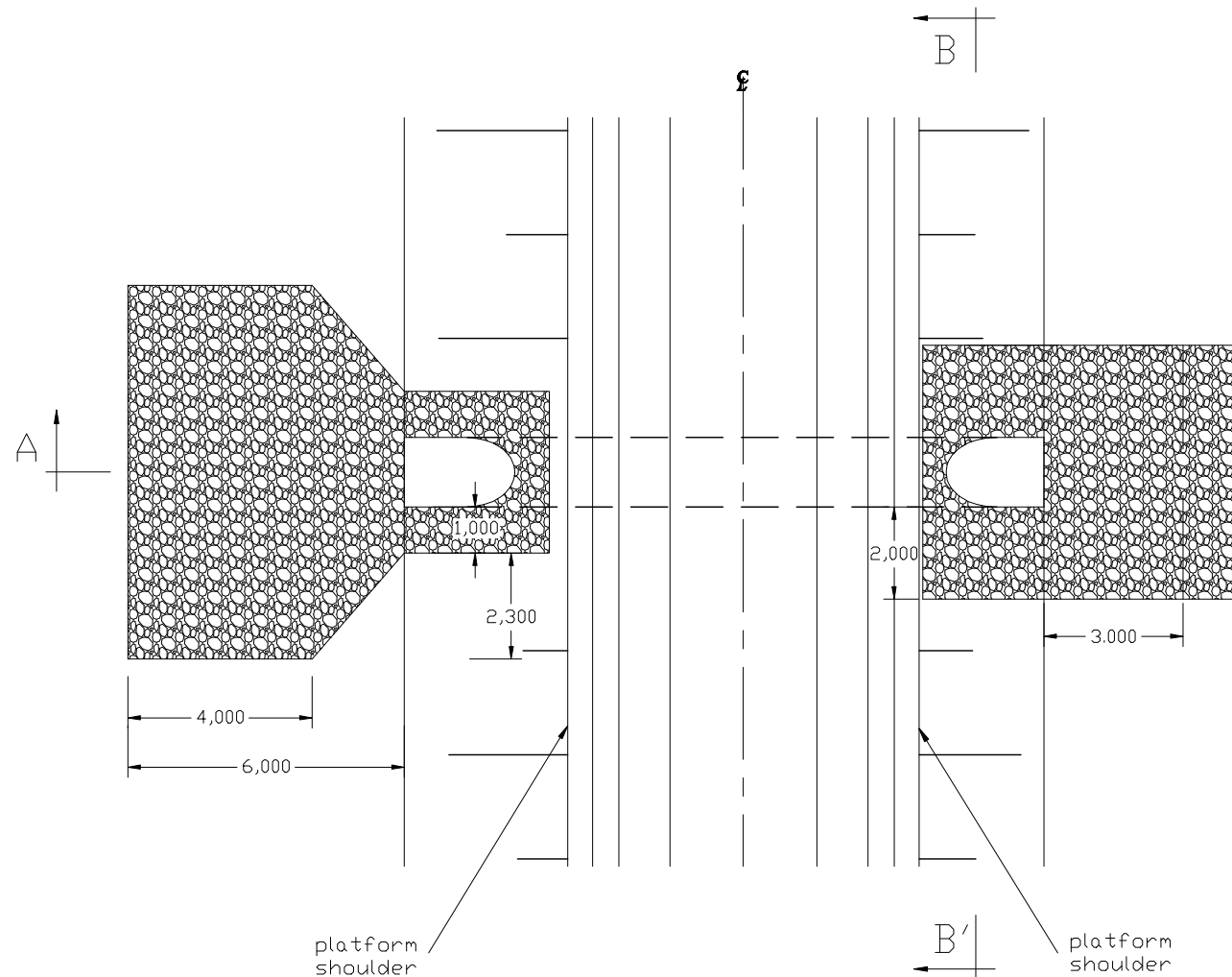
1. All dimensions in mm.
2. In case of bridge located on horizontal curves, adjustments may be required to follow the curvature requirement.
3. See trackwork drawings for rail accessories.

THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN

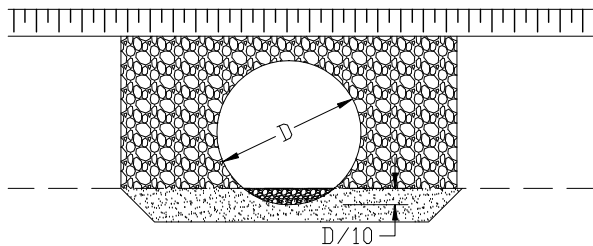
REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	ISSUE RECORD	CURRENT ISSUE FOR:			CLIENT  	 E&C Division Toronto Canada					
							DESIGN	E.F.	12/02/2008	PROCESS				ISSUE	REV.	DATE		PROJECT MARY RIVER IRON ORE PROJECT	TITLE DECK PLATE GIRDER L=24.4 m OPEN DECK	SCALE	AS SHOWN	PROJ No 179700	REV.
							DRAWN	L.Z.	12/02/2008	ENGINEERING				CLIENT APP'L						DRAWING No. DWG-5000-BR-026	1		
							CHECKED			PROJECTS				QUOTATION									
							ACCEPTED			CLIENT				CONSTRUCTION									
	1	MODIFIED		E.F.			12/02/2008																



THIS DRAWING IS NOT VALID UNLESS THE LASTEST REVISION INITIALS ARE HANDWRITTEN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED		DATE		PREPARATION	BY	DATE	APPROVALS	BY	DATE	ISSUE RECORD	CURRENT ISSUE FOR:			CLIENT  PROJECT MARY RIVER IRON ORE PROJECT	 TITLE BR-137-1 LAYOUT SOUTH ROUTE GENERAL VIEW	 E&C Division		Toronto		Canada		SCALE 1:1500	PROJ No 179700	REV.	4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	4	TITLE MODIFIED	E.F				12/02/2008		DRAWN	L.Z.	12/02/2008	ENGINEERING						ISSUE			REV.	DATE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</



PIPE ARCH CULVERT
TYPICAL SECTION

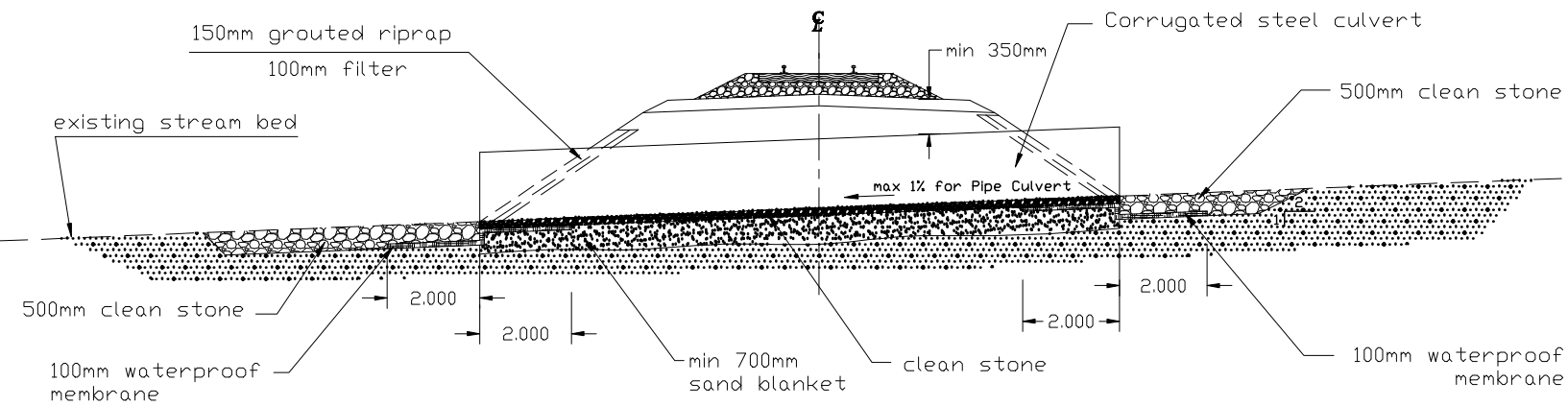


PIPE CULVERT
TYPICAL SECTION

SECTION B - B'

PIPE ARCH PARAMETERS & MAX CULVERT FLOWS		
W (mm)	H (mm)	Q (m ³ /s)
3,100	1,981	1.5
3,730	2,290	5.4
3,890	2,690	10.8
4,370	2,870	18.3

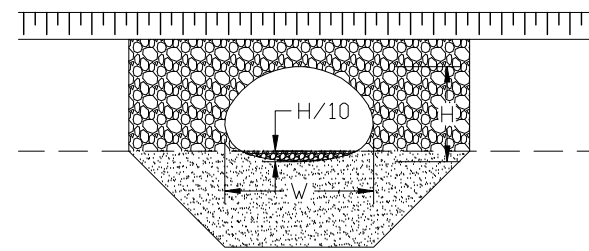
PIPE CULVERT PARAMETERS & MAX FLOWS	
D (mm)	Q (m ³ /s)
1,500	1.56
3,000	9.9



SECTION A-A'

- NOTES:**
1. END SECTION MAY BE REQUIRED ON UPSTREAM INVERTS.
 2. TOE PLATE EXTENSIONS MAY BE REQUIRED DEPENDENT UPON SURFICIAL GEOLOGY.
 3. FOR DETAILS OF EARTHWORK SECTION, REFER TO DRAWING EA-001 AND DRAWING EA-002.
 4. SLOPE OF CULVERT SHOULD BE SIMILAR TO EXISTING WATER STREAM SLOPE WHEREVER POSSIBLE.

REVISIONS	NO	DESCRIPTION	BY	CHK'D	APPROVED	DATE	PREPARATION	BY	DATE	APPROVALS	BY	DATE	ISSUE RECORD	CURRENT ISSUE FOR:			CLIENT  	 E&C Division TorontoCanada							
	3	MAXIMUM SLOPE REDUCED	A.K.			12/02/08	DESIGN	G.S./E.F.	22/08/07	PROCESS				ISSUE	REV.	DATE		PROJECT	TITLE	SCALE	NOT TO SCALE	PROJ No	179700	REV.	
	2	TYPICAL CULVERT CROSS SECTIONS MODIFIED	A.K.			19/10/07	DRAWN	J.Z.	22/08/07	ENGINEERING				CLIENT APP'L					MARY RIVER IRON ORE PROJECT	TYPICAL CULVERT					
	1	ISSUED FOR DESIGN BRIEF	A.K.			22/08/07	CHECKED			PROJECTS				QUOTATION						PLAN & SECTION					
	0	ISSUED FOR COMMENTS	S.G.			02/07/07	ACCEPTED			CLIENT				CONSTRUCTION						ON THAW-STABLE GROUND					
																				DRAWING No.			DWG-5000-00-001		



The diagram illustrates a circular hole of diameter D in a concrete slab. The hole is filled with a material represented by a pattern of small circles. The base of the hole is a gravel layer, indicated by a stippled pattern, which tapers to a thickness of $D/10$ at the edge of the hole. A ruler is positioned at the top of the image for scale.

SECTION B – B'

PIPE CULVERT PARAMETER: & MAX FLOWS	
D (mm)	Q (m ³ /s)
1,500	1.56
3,000	9.9



1. END SECTION MAY BE REQUIRED ON UPSTREAM INVERTS.
2. TOE PLATE EXTENSIONS MAY BE REQUIRED DEPENDENT UPON SURFICIAL GEOLOGY.
3. FOR DETAILS OF EARTHWORK SECTION, REFER TO DRAWING EA-001 AND DRAWING EA-002.
4. SLOPE OF CULVERT SHOULD BE SIMILAR TO EXISTING WATER STREAM SLOPE WHEREVER POSSIBLE.

[illegible]

