Date:	2009-08-12							Page	:1 of 4
	Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor								
Del. 6 : U	Del. 6 : Updating Construction and Operating Costs Development of Capital Unit Cost, CAD								ost, CAD
	Technology:	Х	E300+	S	ub-System:	Α	Land Acqui	sition	
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	اث			Sector:	4	•	n/Installation	
		х	F200+		Item:	1 to 9	Urban, Rura	al and Railwa	ay ROW
					Sub-item:		(see page 4		•
Windsor	- Toronto 1995		200+,	Tilting	300+, Exis	sting ROW	300+, N	ew ROW	weighted
Item Nb	Item	Unit	Quantity	Unit Price	Quantity	Unit Price	Quantity	Unit Price	Av. \$1993
Item 1	Urban Land								
1.1	Residential	ha.	47,85	1 117 868	68,85	837 908	11	540 000	917 149
1.2	Commercial	ha.	7,75	980 645	7,75	980 645	28,5	718 947	811 136
1.3 Item 2	Industrial	ha.	131,3	803 656	166,55	708 616	29,116	971 974	770 233
2.1	Rural Land Agricultural	ha.	640,2	32 379	1136,5	50 583	2194	43 732	43 863
2.2	Natural	ha.	040,2	N/A	0	N/A	0	N/A	43 003
Item 3	Purchase of Exist		il ROW	14/71		14/71		14/71	
3.1	CN	ha.	31,9	415 204	200,9	83 743	54,3	318 877	165 044
3.2	CP	ha.	444,9	70 494	310,6	38 703	9	500 000	62 634
3.3	VIA	ha.		N/A	0	N/A	0	N/A	
	total		1304		1891		2326		
								-	
	- Montreal 1995			Tilting	300+, Existin			ew ROW	weighted
Item Nb		Unit	Quantity	Unit Price	Quantity	Unit Price	Quantity	Unit Price	Av. \$1993
1.1	Urban Land Residential	ha	01.2	968 416	122,9	733 646	87,3	891 835	846 499
1.1	Commercial	ha. ha.	81,3 2	750 000	1,7	750 000	35,4	255 326	301 714
1.3	Industrial	ha.	44,9	794 788	140,0	676 830	143,6	331 021	541 765
Item 2	Rural Land		,-		-,-		-,-		
2.1	Agricultural	ha.	428,1	7 761	1194,8	12 014	1870,0	11 918	11 441
2.2	Natural	ha.	219,7	3 233	216,9	2 501	494,0	2 474	2 659
Item 3	Purchase of Exist	ting Ra	il ROW						
3.1	CN	ha.	736,5	101 801	181,6	74 250	147,9	127 845	100 721
3.2	CP	ha.	3,5	700 000	23,4	2 915	17,7	3 442	57 828
3.3	VIA total	ha.	267 1 783	3 138	205,5 2 087	2 319	0 2 796	N/A	
	lotai		1 703		2 007		2 7 90		
Montrea	I - Quebec 1995		200+.	Tilting	300+, Existir	na ROW	300+. N	ew ROW	weighted
Item Nb		Unit	Quantity	Unit Price	Quantity	Unit Price	Quantity	Unit Price	Av. \$1993
Item 1	Urban Land		-		-		-		·
1.1	Residential	ha.	120,1	182 114	124,1	147 691	88,6	231 237	182 356
1.2	Commercial	ha.	7,5	453 400	7,5	453 400	5	453 400	453 400
1.3	Industrial	ha.	37,5	293 605	41,5	311 295	20,5	410 302	325 026
Item 2	Rural Land								
2.1	Agricultural	ha.	555	17 688	692,57	12 063	752,39	11 845	13 542
2.2	Natural	ha.	138	1 083	200,5	1 254	372,5	12 179	6 945
1tem 3 3.1	Purchase of Exist		0	N/A	0	N/A	0	N/A	
3.1	CP	ha. ha.	283,4	51 951	231,58	44 376	0	N/A N/A	48 545
3.3	VIA	ha.	0	N/A	0	N/A	0	N/A	70 070
	total		1142	- ***	1298	1	1239		
			-		-		-		
OUEBEC WIT	Ecol	ra	in	By: JC. T	herrien, ing.,	Dessau	Continued:	х	

Date:	2009-08-12						Page: 2 of 4	
Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor								
Del. 6 : Up	odating Construction	n and Opera	ating Costs		Dev	elopment of	Capital Unit Cost, CAD	
	Technology: X	E300+	Si	ub-System:	Α	Land Acquis	sition	
				Sector:	4	Construction	n/Installation	
	Х	F200+		Item:	1 to 9	Urban, Rura	al and Railway ROW	

Sub-item:

(see page 4 of 4)

Determination of multiplicators for agricultural land value, from 1993 to 2009:

Value of Agricultural Land (including Buildings), (dollars) STATCAN							
	Ontario	Québec	Ontario	Québec			
	per acre	per acre	per ha	per ha			
1993	2144	977	5 295 \$	2 413 \$			
1994	2134	1031	5 271 \$	2 546 \$			
1995	2188	1114	5 404 \$	2 751 \$			
1996	2384	1220	5 888 \$	3 013 \$			
1997	2671	1428	6 597 \$	3 527 \$			
1998	2813	1572	6 948 \$	3 883 \$			
1999	2900	1696	7 162 \$	4 189 \$			
2000	2964	1789	7 320 \$	4 418 \$			
2001	3028	1856	7 479 \$	4 584 \$			
2002	3248	2017	8 022 \$	4 982 \$			
2003	3466	2126	8 560 \$	5 251 \$			
2004	3712	2211	9 168 \$	5 461 \$			
2005	3938	2302	9 726 \$	5 685 \$			
2006	4201	2379	10 376 \$	5 876 \$			
2007	4388	2429	10 837 \$	5 999 \$			
2008	4593	2609	11 344 \$	6 444 \$			
1996/1993		1,2487206					

1993 to 2008:	incremental factor:	2,142257	2,670420
	Annual Growth, %:	5,21%	6,77%
2009		11 935 \$	6 880 \$
1993 to 2009:	incremental factor:	2,254	2,851
1993 to 2009:	retained Multiplicators:	2,25	2,85

annual mean, 16 years: 5,20% 6,75%

Date: 2009-08-12 Page: 3 of 4 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor Del. 6: Updating Construction and Operating Costs **Development of Capital Unit Cost, CAD** Α Technology: E300+ Sub-System: Land Acquisition 4 Construction/Installation Sector: Χ F200+ Item: 1 to 9 Urban, Rural and Railway ROW (see page 4 of 4) Sub-item: Determination of multiplicators for residential land (including building), from 1993 to 2009: STATCAN Table 327-0005: Price Index, New Household (Land and Building), Annual(1) Ottawa-Toronto & Gatineau, Hamilton, London, Windsor, Average, Oshawa, Québec, province * Ontario/ Ontario Ontario Ontario Ontario Ontario Québec 1992=100 1992=100 1992=100 1992=100 1992=100 1993 99,7 96,9 97,3 100.1 99.9 101,2 1994 100 96,9 96,5 100,1 99,6 101,8 1995 97,9 98,2 95,5 97,4 100,6 101,4 1996 96,5 96,5 94,6 96,3 100,6 100,4 1997 97 98,7 98,1 97,6 104,4 99,6 97,3 97,7 1998 101,8 101,7 105,3 101,7 103,4 1999 98.7 102,6 98,3 105,7 102,0 2000 104,1 106,6 105,4 101,3 106,5 104,4 2001 104 119,9 108,9 107,4 106,4 108,0 2002 129,5 112,6 111,2 106,3 106,9 114,3 2003 120,6 2004 128,0 2005 134,0 Not Available 2006 143,2 2007 148,1 2008 157,7 2009 165,0 2002/1993 1,299 1,162 1,143 1,062 1,070 1,147 1,129 2009/2002 Québec : 44,36% increase (Ontario = ?, assumed like Québec) 1,4436 2009/1993 1,875 1,677 1,650 1,533 1,545 1,66 1,63 *: Land only **EcoTrain** Х By: J.-C. Therrien, ing., Dessau Continued:

Date:	2009-08-12							Page: 4	of 4
		Upda	ted Feasil	oility Study	of a High Sp	eed Rail Se	rvice		
		Opau			y – Windsor		V100		
Del. 6 : L	Jpdating Const	ructio				Developmen	nt of Capita	I Unit Co	st, CAD
	Technology:		E300+		Sub-System:	 A	Land Acqu		
	reclinology:	Х	⊑300 +		Sector:	4	Constructi		ation
			F200+		Item:	1 to 9	Urban, Ru		
		Х	F200+		Sub-item:	1 10 9	(see below		ali now
				<u> </u>	Sub-item:		(see pelow	")	_
	- Toronto 1995		weighted			Say			
Item Nb	Item	Unit	Av. \$1993	multiplicator	Unit price	_	Sub-ite	em Nb	
Item 1	Urban Land		0.7	1993 -> 2009	(2009)	(\$ ₂₀₀₉ /ha)			_
1.1	Residential	ha.	917 149	1,66	1 522 468	1 500 000	1.4		
1.2	Commercial	ha.	811 136	1,66	1 346 486	1 350 000	2.4		
1.3 Item 2	Industrial Rural Land	ha.	770 233	1,66	1 278 587	1 280 000	3.4		
2.1	Agricultural	ha.	43 863	2,25	98 691	100 000	4.4		
2.1	Natural	ha.	+3 003	2,20	30 031	N/A	5.4		
Item 3	Purchase of Exis		il ROW] 3.4		
3.1	CN CN	ha.	165 044	‡ 1,60	264 070	265 000	6.4		
3.2	CP	ha.	62 634	1,60	100 215	100 000	7.4		
3.3	VIA	ha.				-	9		
	total								
				-					
	- Montreal 1995		weighted						
Item Nb		Unit	Av. \$1993						
Item 1	Urban Land		0.40.400	4.00	4 405 400	4 400 000	4.0	4.0	
1.1	Residential	ha.	846 499	1,66	1 405 189	1 400 000	1.2	1.3	
1.2	Commercial Industrial	ha.	301 714 541 765	1,66	500 845 899 330	500 000	2.2 3.2	2.3 3.3	
Item 2	Rural Land	ha.	341 763	1,66	099 33U	900 000	3.2	3.3	
2.1	Agricultural	ha.	11 441	2,25	25 743	26 000	4.2	4.3	
2.2	Natural	ha.	2 659	2,25	5 984	6 000	5.2	5.3	
Item 3	Purchase of Exis			, -					
3.1	CN	ha.	100 721	1,60	161 153	160 000	6.2	6.3	
3.2	CP	ha.	57 828	1,60	92 525	100 000	7.2	7.3	
3.3	VIA	ha.				-	9		
	total								
Manatana	L Ougher 1007	1 1		I					
Montrea Item Nb	I - Quebec 1995	Unit	weighted						
	Urban Land	UIIIL	Av. \$1993						
1.1	Residential	ha.	182 356	1,63	297 240	300 000	1.1		
1.2	Commercial	ha.	453 400	1,63	739 042	740 000	2.1		
1.3	Industrial	ha.	325 026	1,63	529 793	530 000	3.1		
Item 2	Rural Land			, - 0					
2.1	Agricultural	ha.	13 542	2,85	38 595	40 000	4.1		
2.2	Natural	ha.	6 945	2,85	19 792	20 000	5.1		
Item 3	Purchase of Exis	ting Ra	il ROW						
3.1	CN	ha.				N/A	6.1		
3.2	CP or CGRY	ha.	48 545	1,60	77 671	80 000	7.1	8	
3.3	VIA	ha.		94€	0.00/	-	9	o 2000	J
	total			**	3.0% mean ar	inuai increase 1	1993 t	0 2009	
OUEBEC - WIT	Ecol	Γra	in	By: JC. The	errien, ing., Des	sau	Continued	l:	

Date:			Page: <u>1</u> of <u>5</u>					
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING								
Technology: \Box	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W		B - EARTHWORKS 4 - CONSTRUCTION 1 - CLEARING					
Geographical Variation	Geographical Variation ? \square no \square yes If yes, indicate segments applicable:							
1.1 - Type 1 Soils	,							
aparticular communication and accommunication of the property	00 m wide corridor - (per/km)	1965-91-10-19 #01666						
1,000 m x	$50 \text{ m} = 50,000 \text{ m}^2 = 5 \text{ ha}$.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
	23 m average							
,								
	- <u> </u>	0.30 m						
	Remove to	opsoil and replace						
		ted material						
			······································					
(1) Clea	aring - (scraper work):							
	5 ha @ \$ 5,000 /ha = \$ 2 !	5,000 /km	Torkini tao 1 mininahanka 1999 William 1975-1972 markananan magangga papapa					
	\$8,000 \$4	0,000						
(2) Exc	avation of unsuitable material	and backfill:						
· · · · · · · · · · · · · · · · · · ·	23 x 0.3 x 1,000 m/km =	= 6,900 m ³ /km						
			.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
Cas	e 1 - 2a) Assuming 5 km hau	lage						
	34 0 4	2 2 2						
(2.8	11) Exc → 6,900 m ³ /km @ \$2 \$3	$\frac{2.5}{\text{m}} = \frac{\$17,250}{\text{km}}$ $\frac{\$24,150}{\text{km}}$	1Pleast jet jihikishijita tilk aitilakilakannia kansalala; jali tajif 1940-1990-1990					
	a2) Disposal → assuming 5 kr		· m³/km					
\2.0		$m^3/km = $20,700/km$	TH /KH					
	7010/Hi X 0/000	,						
Prepared by:			continued 🗹					

Date:				Page: <u>2</u> of <u>5</u>				
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING								
Technology:	PARTIES OF STREET, PARTIES OF ST	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sub-system: Sector: Item:	B - EARTHWORKS 4 - CONSTRUCTION I - CLEARING				
Geographical V	ariatio	n? 🗆 no 🗖 yes If yes, ind	dicate segments applica	ble:				
	Case	2 - 2b) If all backfill is borro	ow material, assuming 1	10 km avg. haulage				
	(2.b1) \$1 7,250 /km (same as in 2.a1) \$24,150							
	(2.b	2) \$20,700/km (same as in	2.a2)					
	(2.b	3) Excavation, placement ar 6,900 m³ @ \$3/r	nd compaction of select n ³ = \$ 20,700 /km	ed material:				
		\$6	\$41,400					
	(2.h	\$0.60 4) Haulage @ \$0.5 0 per m³	/km					
		pp	$m^3/km = $34,500/km$					
		\$6.0	\$41,400					
(3)	Dem	olition of buildings and other	r structures					
		Lump sum \$1 0,000 /km (f 2 houses/km)				
		\$20,000	in the second se					
Total	Item 1	.1						
	Case	e 1 - Total = [(1) + (2a) + (3)]	+ 10% allowance for	misc. items				
		\$1	15,000					
	(No	borrow. Free haulage) = \$8	0,000 /km					
	Cas	e 2 - Total = [(1) + (2b) + (3)] + 10% allowance for	misc. items				
			\$184,000					
	(All	borrow. 10 km haulage) =	\$ 142,000/ km					
			\$150,000					
	Cas	e 3 - Average of Case 1 & C	ase 2 = \$ 111,000 /km	. 11 6.14 100.00				
Prepared by:				continued 🗹				

Date:			Page: <u>3</u> of <u>5</u>					
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING								
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sub-system: Sector: Item:						
Geographical Variatio	n ? 🗆 no 🗖 yes If yes, in	dicate segments applical	ble:					
1.2 - Type 2 Soils;	1.2 - Type 2 Soils; 1.3 - Type 3 Soils							
	0 m wide corridor - (per km)							
1,000 x 50	$m = 50,000 \text{ m}^2 = 5 \text{ ha}$							
	Geotext	ile	-					
	V////////	/////// d	10.44					
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
Item 1.2 : d	= 1.5 m; w = 23 m							
Item 1.3 : d	= 2.0 m; w = 31 m							
	\$40,000							
(1) Clea	aring (scraper) = \$2 5,000/ kr	m (same as in 1.1)						
	avation and backfill:	04 500 3//						
	tem 1.2 : 23 x 1.5 x 1,000							
TOT	tem 1.3 : 31 x 2 x 1,000 =	02,000 H /KH						
Cas	e 1 - (2a) If backfill material	is <u>hauled</u> from excavation	on item, free haulage					
		\$3.5	\$120.750					
Iten	1 1.2: (2.a1) Exc → 34	,500 m³/km @ \$ 2.5 /m³						
	(2.a2) Disposal	→ assuming 5 km haula	ge @ \$0.60 per m³/km					
	0.60 x 5 x 34,500 = \$103,500/km							
	(2a) Total, item 1.2, case 1 : \$224,250/km							
Prepared by:			continued 🗹					

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	QUE				H SPEED RAIL PRELIMINARY ROUTING	OJECT
Technology:		300.+ k	ph - new ph - exis ph - exis	t. R/W	Sub-system: Sector: Item:	B - EARTHWORKS 4 - CONSTRUCTION 1 - CLEARING
Geographical V	ariatior/	1 ? 🔲 no	☐ yes	If yes, inc	dicate segments applica	ble:
	ltem	1.3:	(2.a1)	Exc → 62,	.000 m³/km @ \$ 2.5 /m³	
					\$3.5	\$217,000
			(2.a2)	Disposal	→ assuming 5 km haula	ge @ \$0.60 per m³/km
		>-\ T - (- 1			x 62,000 = \$186,000	/km
					\$403,000/km	101
	<u>Case</u>	2 - (2b)	If all bac	kfill is borr	row material, assuming	10 km avg. haulage
	Item	1.3:	(2.b1)	\$ 155,000	9/km (same as in 2.a1)	
			(2.b2)		O/km (same as in 2.a2)	
			(2.b3)	Excavation	on, placement and comp	paction of selected
				material:		
				62,000 x	6 \$372,000	
The second secon			(2.b4)	Haulage	\$0.60 @ \$0. 50 per m³/km	
					0 x 62,000 = \$3 10,00	
			(2b) To	0.60 tal, item 1	\$372,00 .3, case 2 : \$1,147,000/	
	ltem	1.2:			/km (same as in 2.a1)	
Mark to Mark t				\$120,750)	
			(2.b2)	\$103,50	0/km (same as in 2.a2)	
	*****		.,,		6 \$207,000	
			(2.b3)	\$34,500) x <mark>3</mark> 6 = \$103,500/km	
		•			.60 \$207,0	
					. 50 × 34,500 = \$ 172,	
			(2b) Tot	al, item 1.	2, case 2 : \$638,250/km	
		<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>		g g - g		
	, HWAIT .					
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Date:	Page: <u>s</u> of <u>6</u>								
	QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING								
Technology:	□ 300 + kph - new R/W Sub-system: B - EARTHWORKS □ 300 + kph - exist. R/W Sector: 4 - CONSTRUCTION □ 200 + kph - exist. R/W Item: I - CLEARING								
Geographical Va	Geographical Variation ? 🔲 no 🔲 yes If yes, indicate segments applicable:								
(3)	Demolition of structures = lump sum = \$10,000/km								
	\$20,000 \$4.80								
(4)	Geotextile @ \$3/m²								
	4.80 \$110,400								
	23 x 1000 x 3 = \$ 69,000 /km								
Total I	em 1.2								
	Case 1: $[(1)+(2a)+(3)+(4)] + 10\%$ allowance for misc. items								
	(No borrow. Free haulage) = \$323,000/km \$434,000								
, and the latter to the latter	Case 2: [(1)+(2b)+(3)+(4)] + 10% allowance for misc. items								
	(All borrow. 10 km haulage) = \$ 627,000 /km								
	\$890,000 \$662,000								
	Case 3 : Average of Case 1 & Case 2 = \$475,000/km								
Total	em 1.3								
	Case 1: [(1)+(2a)+(3)+(4)] + 10% allowance for misc. items								
	(No borrow, Free haulage) = \$490,000/km \$631,000								
	Case 2: $[(1)+(2b)+(3)+(4)] + 10\%$ allowance for misc. items								
	(All borrow, 10 km haulage) = \$1 ,035,000 /km \$1,449,000								
	Case 3 : Average of Case 1 & Case 2 = \$763,000/km								
	\$1,040,000								
Prepared by:	continued								

Date:					Page: <u>1</u> of <u>2</u>
	QU	EBEC-ONTARIO UNIT COSTS FO			OJECT
Technology		300 + kph - new R/W 300 + kph - exist. R/ 200 + kph - exist. R/	w	Sub-system: Sector: Item:	
Geographic	al Variatio	n?□no□yes Ify	es, indicate seg	ments applica	ble:
ITEM 2 - 1	EMBANKN	IENT CONSTRUCTION			
					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Excavatio	n (free hau	lage of 500 m in eithe	r direction of er	nbankment, al	long R.O.W.);
placemen	t and comp	paction:	at all the transfer of the tra		
				\$6	
2.1 - Sc	oft excava	ted material (scraper; s	mali dozer worl	$k) = $3/m^3$	
		\$2	21		
2.2.a - S	oft rock (la	arge dozer work) = \$1	5 /m³) \$28	8
		\$3	5) Use \$ 16	3/m ³
2.2.b - Ha	ard rock (b	lasting required) = \$2	5/m³)	
and taked a that a state of the		rood or believe shiftly fill he had a been been broad bould by the beautions of transfer and		In the printing of the printin	
.,	orrow mate		***************************************		
(s	oil excavat	tion) = \$ 3 /m ³			
			2		
Α	ssuming 5	km avg. hauling @ \$0		83/m³ + \$3/m 86	3
·····		= \$6/m ³			
			\$0,60	\$6 \$6	3
Α	ssuming 1	0 km avg. hauling @ \$	0.50/m ² /km =	\$5/m" + \$3/I	m-
leas 1/ . 185 lgt 1/1 174 quipture		= \$8/m ³ \$12	The state of the s		ात (अन्य अनेकार्यः स्थितः स्थितः स्थानिक स्थापः स्थापः स्थापः स्थापः स्थापः स्थापः स्थापः स्थापः स्थापः स्थाप
		\$21	• • • • • • • • • • • • • • • • • • • •		
5	OIT FOCK EX	cavation = \$15/m³			**************************************
Α	eeumina 1	0 km avg, hauling @ \$	0.60 0.50/m³/km		
A	ssummy 1	= \$5/m ³ +			e- over the area distributed and an area of the second and the sec
		= \$ 20 /m ³	\$21		
		\$27			
or attached to the				WF 1918-	
		A CONTRACTOR AND A CONT			
Prepared b	y:				continued 🗹

Date:			Page: 2 of 2					
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING								
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sector:	B - EARTHWORKS 4 - CONSTRUCTION 2 - EMBANKMENT					
Geographical Variation	n ? 🗆 no 🗖 yes If yes, ind	dicate segments applica	ble:					
2.4 - Disposal of uns	suitable material							
	\$3.5 Excavation = \$2.5/m³							
Disposal (as:	suming 5 km haulage @ \$0.	60/m³/km)						
	$= 0.6×5 $= $3/m^3$							
Total cost	\$6.5 = \$ 5.5 /m³							
Prepared by:			continued \Box					

Date: 2009-11-27 Page: 1 of 2 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor Del. 6: Updating Construction and Operating Costs **Development of Capital Unit Cost, CAD** Technology: X E300+ Sub-System: В Earthworks and drainage Construction 4 Sector: 2 F200+ Item: **Embankement construction** Extra cost for fills on sensitive clays Sub-item: 2.5 Alternative 1 : Light fill with polystyrene Volume of light fill for railroad embankement Assume: 23 m wide embankement base (15 m wide at the top) 2 m high Replacement of portion of conventional fill by light fill (polystyrene blocks 60 x 120 x 2400 cm (2' x 4' x 8')) 31,2 m² Light fill section area = $2' \times (64' + 56' + 48') / 10,76 \text{ ft}^2/\text{m}^2 =$ 31 200 m³/km Light fill volume / km = Unite price of light fill = 107 \$ \$/m³ Light fill cost / km = 3 338 400 \$/km Less conventional backfill = -31 200 x 12 \$/m³ = -374 400 \$/km Unit Cost for Alternative 1: 2 964 000 \$/km 3 000 000 \$/km say: Conventional fill polystyrene blocks

By: Morteza Esfehani, ing., Ph.D.

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Continued:

EcoTrain

Date: 20	09-11-27					Page: 2 of 2
	Up	dated Fe	asibility Study of a	High Spee	ed Rail Service	е
		in t	he Québec City – W	indsor Co	orridor	
Del. 6 : Updati	ng Constructio	n and Ope	rating Costs	Dev	velopment of Ca	apital Unit Cost, CAD
Tech	nology: X	E300+ F200+	Sub-System Sector Item Sub-item	: 4 : 2	Earth work and Construction Embankement	-
						o di conolavo diayo
<u>Alterr</u>	Assume: 23 m th	wide embar nick	f clay deposit with venkement base (15 m wich tical drains + a 2-year s	de at the top)		
	entional fill section			<u> </u>		m ²
	fill for compensa volume or extra				23 23 000	m ² m ³ /km
Unite	price of extra fill	(borrow) m	aterial :		12,00	\$/m ³
Total	cost of fill :				276 000	\$/km
Numb Vertic	ertical drain dep er of vertical dra al drain length p price of vertical	ins / m of r	ailroad : ailroad : ase + installation) :		33 16 527 083 5,00	m
Vertic	al drain cost per	km :			2 635 417	\$/km
Unit o	cost for alterna	tive 2 =		say	2 911 417 2 900 000	**
			Light fill with polystyn		3 000 000 npact on constru	
	coTra	in	By: Morteza Esfehani,	ing., Ph.D.	Continued:	П
OUEBEC - WINDSOF			DESSAU			

Date:			Page: <u>/</u> of <u>/</u>			
QU	EBEC-ONTARIO HIGH UNIT COSTS FOR PRI		OJECT			
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W		B - EARTHWORKS 4 - CONSTRUCTION 4 - SUB - BALLAST			
Geographical Variation	Geographical Variation ? 🔲 no 🔲 yes If yes, indicate segments applicable:					
ITEM 4 - SUB-BALL	ITEM 4 - SUB-BALLAST LAYER:					
\$18.50 (i) @ \$ 1 5/m ³	with borrow material					
Assuming a	0.9 m layer					
(ii) With availa	14.5 14 m 1 I I I I 14.5 + 17.2 (14 + 16.7) X 0.9 X 1000 2 = \$228,000/km \$290,000 ble material, rate to be adjust	ed to eliminate haulage	\$0,60			
		<u> </u>				
	= \$ 152,000 /km \$196,000					
Prepared by:			continued			

Date:	<u></u>				Page: _L_ of _L_
	QUI			I SPEED RAIL PRELIMINARY ROUTING	OJECT
Technology:					4 - CONSTRUCTION
Geograp	ohical Variatio	n ? ☐ no ☐ yes l	lf yes, inc	dicate segments applica	bie:
5.1	Normal R.O.	.W:			
,	,		•••••		
(1)		no. 450 to 900 mm		all (1871) (1990)	
	\$ 7 5, \$350	$/m \times 25 m \times 4 = 7	7,500 /km <mark>35,000</mark>	1	
(2)	Assuming 5	0% of the route req	uires 200	0 mm subdrains on both	ı sides
		/m x 1,000 m = \$1		n	
	\$42	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	42,000		
(3)	Assuming \$5,000/km for other drainage items \$10,000				
Total	Item 5.1				
	= [(1)+(2)	+(3)] +10% allowa	nce for r	niscellaneous items	
	= \$	25,00 0/km			
		\$95,000	.,		
5.2	Major Wate	rcourse Culverts	.,		
	Assume a 4	10 m (4 m dia.) culv	ert includ	ling head walls	
	\$87	⁷ 5/m x 40 m = \$ 35		h	
	\$1.	100 \$44	,000	The state of the s	
5.3	Environmen	ital Stormwater Con	itrols		
			00,000		O v 20 v 2 m doop pand
***********	Cost of settlement pond = \$70,000 including excavation for 50 x 30 x 2 m deep pond,				
	one inlet, o	ne outlet and restor	ation of a	site.	#40.000
	Δeeume nro	ovision of one settle	ment po	nd for every 10 km, use	\$10,000 e rate of \$ 7,000 per
	route-km.	5.10,01. 01 0110 00010	po		
					1
Dranar	ed by:				continued \Box

Date:			Page: <u>/</u> of <u>/</u>			
QU	QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING					
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sector:	B - EARTHWORKS 4 - CONSTRUCTION 6 - ROADBED UPERADE			
Geographical Variatio	n ? \square no \square yes If yes, inc	licate segments applica	ble:			
	UPGRADE ON EXISTING R.					
	<u> </u>					
		Ass	sume 2 m			
	$\times \times $					
^Z Exis	ting embankment / N	ew embankment	· · · · · · · · · · · · · · · · · · ·			
Benching of	existing slope = sart 2 ²	+ 32/				
	= 3.61 n	² @ \$40/m²				
	= \$1.45/1 = 5 m/hr	m @\$250/hr = \$50/m				
Embankmer	at construction = $16.7 x$	2 \$12.25				
with borrow	/ material = 33.4 n \$409 = \$2 68 /1					
Add	50% for working in close p	oximity of operation				
	= \$4 02/ \$614 \$50	the state of the s				
Total cost		+ \$4 02) + 10% allow	vance for misc. items			
= \$600/m say \$730						
Prepared by:			continued \Box			

Page: 1 of 1					
Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor					
Del. 6 : Updating Construction and Operating Costs Development of Capital Unit Cost, CAD					
Technology: X E300+	Sub-System:	В	Earthworks and Draina	age	
_	Sector:	4	Construction		
x F200+ Item			Retaining Structures		
	Sub-item:		7.1 - 7.2		
•					

Item 7.1 Retaining Structure up to 3 metres in height

Cost / Retaining Structure up to 3 metres in height = \$650 / sq.m.

Assume average structure is 2.5 m in height.

 $$650 \times 2.5 = $1,625 / m$

Add 20% for difficult foundations / site constraints as per 1994 QOHSRP Preliminary Routing and Costing Study - Interim Report No. 3

Use \$2,000,000 / km

Item 7.2 Retaining Structure over 3 metres in height

Cost / Retaining Structure over 3 metres in height = \$750 / sq.m.

Assume average structure is 10.0 m in height.

$$750 \times 10.0 = 7,500 / m$$

Add 20% for difficult foundations / site constraints as per 1994 QOHSRP Preliminary Routing and Costing Study - Interim Report No. 3

$$$7,500 \times 20\% = $9,000 / m$$

= \$9,000,000 / km

Use \$9,000,000 / km

EcoTrain By: B.k	K., MMM Group Ltd.	Continued:
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Date:	New York			Page: <u>I</u> of <u>I</u>
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING				
Technology:		300+ kph - new R/W 300+ kph - exist. R/W 200+ kph - exist. R/W	Sector:	B - EARTHWORKS 4 - CONSTRUCTION 9 - NOISE BARRIERS
Geographical V	ariation	n ? 🗆 no 🔲 yes If yes, inc	dicate segments applica	ble:
ITEM 9	NOIS	SE ATTENUATION STRUCTU	IRES	
9.1	Barri	ers		
	Assu	ıming 3 m in height: \$1,20	0	
	from	MTO Unit rates = \$000/r	<u> </u>	000
		10% allowance for miscellar	neous items = \$ 660,0 (90 /km
		15 <u>+</u> %		
9.2	Berm	18		
		3		
				\$12 (see B-2.3)
hilbita olimin munika manan majara manan	Assu	ıming all borrow material, av	erage hauling of 10 km	@ \$ 11 /m³
		···········	30,000	
***************************************		2 x 1,000m x 11 /m ³ = \$165		00
	Add	I 15±% allowance for miscel	ianeous items = \$210,0	00
that were that a differ that the form of the second of the				
	·····			
	•			
. , magain magain agus mara mananan mara an				The state of the s
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Date:				Page: of	
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING					
Technology:		300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sector:	B - EARTHWORKS 4 - CONSTRUCTION 10 - FENCING	
Geographical Var	iatior	n? 🗆 no 🔲 yes If yes, inc	dicate segments applica	ole:	
ITEM 10	ROW	SECURITY FENCING (BOTH	I SIDES)		
		\$5 \$130,000 28/m = \$56,000/km			
Prepared by:			Andrew	continued \Box	

Date:			Page: <u>/</u> of <u>4</u>			
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING						
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sector:	C - BRIDGES 4 - CONSTRUCTION 1.1 - SMALL RIVERS			
Geographical Variation	on ? \square no \square yes If yes, inc	dicate segments applicat	ole:			
Small River Bridges	± 20m					
Based on bridges d	esigned and estimated, cost o					
		\$250	00/sq.m.			
Assume width of b	ridge (2 tracks) = 13 m					
	13.5 m					
·	3 = \$1 6,900 /m 13.5 = \$33,750/m		8.6.11 · · 115.16.5. · 115.16.5. · 115.16.5. · · · · · · · · · · · · · · · · · ·			
	$9 \times 20 = $340,000/each$					
\$33,75						
	n and the state of		so-Attititatista etako kan kan kan kisaka kan kisaka kan kisaka kan kisaka kisaka kisaka kisaka kisaka kisaka k			
		411 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4				
	ommendammentamiikilikki kariikkilikki kilvevillavetilävet, visa terminalaksi. Tenkilivet	,	dock kanner og det en mer kriver for en skriver der til blek typerfor opnant om en en flyttinge			
Prepared by:			continued \Box			

Date:		op.	Page: <u>2</u> of <u>4</u>		
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING					
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sector:	C - BRIDGES 4 - CONSTRUCTION 1.3 - INTERM. RIVERS		
Geographical Variation	n? 🗆 no 🗀 yes If yes, ind	licate seaments applical	ole:		
Intermediate River B	ridges 300 - 100 m				
	30 - 100 m				
Based on bridges de	signed and estimated, cost o				
n ondred had the party property many and Mathematic Property and the delication of t	AMANAM DERMI ERMENTEREN MERINARIA INNEREN PERENTEREN MERINARIA MERINARIA INNEREN MERINARIA MERINARIA MERINARIA		00/sq.m.		
Assume width of bri	dge (2 tracks) = 13 m 13.5 m				
\$1,800 x 13	= \$ 23,400 /m				
\$3,000 x 13	3.5 = \$40,500/m		a lata dak Milak Matak Matak Matak Magay i paga panggarandigan ana dak da dak da dak da Matak Matak Matak Mata		
records to the Maria (Maria), Maria (Maria) (Colored Colored C		anning and a state of the state	n talahatu 1866 katis 1868 1868 1868 1868 1864 talahat 1868 1863 ingan pengapangan bandaran bandaran 1863 ingan		
			tent transferri en rediction (1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-		

	ernere _{er e} ndelset ersker i Norderfaksiske fraktiske fraktiske fortelskil i NYM tredd _{forte} if erne telskal skildskil		A STATE OF THE PARTY OF THE PAR		

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Date:		Подражения в подраже	Page: <u>3</u> of <u>4</u>
QU	EBEC-ONTARIO HIC UNIT COSTS FOR F	GH SPEED RAIL PEPPELIMINARY ROUTING	ROJECT
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sub-system: Sector: Item:	4 - CONSTRUCTION
Geographical Variatio	n ? 🔲 no 🔲 yes If yes,	indicate segments applica	able:
Large River Bridges	100 - 250 m		
Based on bridges de	esigned and estimated, cos		
		[\$4,0	000/sq.m.
Assume width of br	ridge (2 tracks) = 13 m	1	
	13.5 m		
	x 13 = \$41,600/m		The state of the s
,,	3.5 = \$54,000/m		
Same cost applies t	o the major river bridges.		
1.7) Major River B	ridges >250 m		
· ·	emium from the Large I 00/sq.m. = \$5,000/sq.m	•	
Assume width of b	oridge (2 tracks) = 13.5	m	
\$5,000 x 13	8.5 = \$67,500 ; use \$7	70,000	
	W December 2015 and the State of the State o	based blidder die land de 1948 W. 1830 - 1940 - 1940 - 1940 - 1940 - 1940 - 1940 - 1940 - 1940 - 1940 - 1940 -	
		,	,
I DESCRIPTION OF THE PROPERTY	arrangapa ^{rra 2000} (1994) (1914) (1915) (1915) (1914) (1914) (1914) (1914) (1914) (1914) (1914) (1914) (1914) (1914)	gannaman na santanan na santanan dikkan ta kaki ta _{sang} ng paganan ana santan sah	to about the set of the second second set of the set of the set of
months (1911) My My printing and months (1914) (1914) (1914) (1914)	Pulpuruli,	MB-1 To-Mildren and a second an	ALCERTAL PROPERTY OF THE PROPE
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QU	EBEC-ONTARIO HIG UNIT COSTS FOR PR	H SPEED RAIL PR ELIMINARY ROUTING	OJECT			
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sub-system: Sector: Item:	C - BRIDGES 4 - CONSTRUCTION 1.9 - BRIDGE MODIF.			
Geographical Variation	n? 🗆 no 🗖 yes If yes, in	dicate segments applica	ble:			
New deck for 1 trac	k existing bridge of width 4	m				
,						
Concrete volume		Hand of the Control o	**************************************			
4m x 0.3m	x \$400/m³ = \$480.00/m	\$600/m	***************************************			
	\$500/cu.m.					
Reinforcing steel						
400 kg/m³ x	\$1.25/kg = <u>\$500.00/m</u>	\$700/m	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1			
	\$1.75/kg \$980.00/m	\$1,300/m				
	say \$1,000 /m	use \$1,500/m				
Provision shall be m	Provision shall be made to strengthen existing beam say \$800/m \$1,500/m \$1,800/m \$3,000/m					
Provision for mainte	nance access <u>\$600/m</u>	\$1000/m				
A state of the sta	\$2,400 /m	\$4,000/m	H (1/1900) H (1/1904) P (1/1904)			
For double track HS						
Add new bridge of	width 8 m @ \$1,300 /m² <mark>\$</mark> 2	2,500/sq.m.				
	= \$ 10,400 /m		7			
$$2,500 \times 8 = $20,000/m$						
Total cost = \$	1 0,400 + \$2,400 = \$2	0,000 + 4,000				
= \$	12,800 = \$2	4,000				
= \$13,000/m say use \$26,000						
Prepared by:			continued			

Date:	June 2009				Page: 1 of 1							
	Updated Feasik	oility Study of a High	Speed Rail	Service								
	in the 0	Québec City – Winds	or Corridor	•								
Del. 6 :	Updating Construction and Oper	rating Costs	Developm	ent of Ca	oital Unit Cost, CAD							
	Technology: X E300+	Sub-System:	С	_	Viaducts and Tunnels							
	x F200+	Sector:	4 1	Construct Bridges	tion/Installation							
	<u> </u>	Sub-item:	=	-	er for height over 10m							
1.2	Extra over Unit Cost 1.1 for	height over 10m										
	Unit Cost 1.1 (small river cros	sings, < 30m)	\$675,000 / each									
	Assume the same 25% premium as the QOHSRP report.											
	\$675,000 x 25% = \$168,750											
<u>1,4</u>	1,4 Extra over Unit Cost 1.3 for height over 10m											
	Unit Cost 1.3 (intermediate river crossing, 30 - 100m) \$40,500 / m											
	Assume the same 25% premium as the QOHSRP report.											
	\$40,500 x 25% =	\$10,125	Use \$10,000	/ m								
<u>1,6</u>	Extra over Unit Cost 1.5 for	height over 10m										
	Unit Cost 1.5 (large river cross	sing, 100 - 250m)	\$54,000 / m									
	Assume the same 25% premi	um as the QOHSRP re	eport.									
	\$54,000 x 25% =	\$13,500	Use \$13,500 / m									
	EcoTrain	By: B.K., MMM Group L	imited C	Continued:								

Date:	June 2009						Pag	e: 1 of 1				
	U	pdate	d Feasib	oility Study of a High	Speed F	Rail Service	,					
			in the C	Québec City – Winds	sor Corric	dor						
Del. 6 :	Updating Constr	uction	and Oper	rating Costs	Develo	pment of Ca	pital Unit C	ost, CAD				
	Technology:	х	E300+	Sub-System:		Bridges, Via						
			E000 :	Sector:		Constructio	n/Installatio	n				
		Х	F200+	Item: Sub-item:		Bridges Extra over f	or diff. foun	d. cond.				
1.8	Extra over Ite	ms 1.′	1, 1.3, 1.5	, and 1.7 for difficult	·	on condition	<u>1S</u>					
	No calculation in	n QOHS	SRP report	t.								
	Assume cost to	o be a	pproxima	tely 50% of Item 1.6 (p	proportion	as in QOHS	RP report)					
	Unit Cost 1.6 (Extra over Large Bridge Unit Cost for height over 10m) \$13,500 / m											
	$$13,500 \times 50\% = $6,750$ Use \$7,000 / m											
				ı								
	ECOT	rai	n	By: B.K., MMM Group L	.imited	Continued:	Γ	\neg				

Date:	June 2009				Page: 1 of 1							
	Updated Feasik	oility Study of a High	Speed Ra	il Service								
	in the 0	Québec City – Winds	or Corrido	or								
Del. 6 :	Updating Construction and Oper	rating Costs	Develop	ment of Ca _l	pital Unit Cost, CAD							
	Technology: X E300+	Sub-System:		•	aducts and Tunnels							
	x F200+	Sector:	-	Construction Viaducts	n/Installation							
	X F200+	Sub-item:	2.1 - 2.3	Viaducis								
<u>2.1</u>	Viaducts exceeding 250m in	length										
	No calculation in QOHSRP repor	t.										
	Assume 66% increase from QOHSRP report unit cost											
	Unit Cost 2.1 (QOHSRP) \$27,000 / m											
	\$27,000 x 1.66%	= \$44,820	Use \$45,00	0 / m								
<u>2.2</u>	2.2 Extra over Item 2.1 for height over 10m											
	Assume the same 25% premium as the QOHSRP report.											
	\$45,000 x 25% =	\$11,250	Use \$11,00	0 / m								
<u>2.3</u>	Extra over Item 2.1 for diffic	ult foundation condit	ions									
	Item not used in the QOHSRF	report.										
	Item is assumed to be site spe	ecific.										
QUEBECA	EcoTrain	By: B.K., MMM Group L	imited	Continued:								

Date:	June 2009				Page: 1 of 1							
	Updated Feasik	oility Study of a High	Speed Ra	ail Service								
	in the 0	Québec City – Winds	or Corrid	or								
Del. 6 :	Updating Construction and Oper	rating Costs	Develop	ment of Ca	oital Unit Cost, CAD							
	Technology: X E300+	Sub-System:	С	•	ducts and Tunnels							
	x F200+	Sector:	4 3	Construction Tunnels	n/Installation							
	X F200+	Sub-item:	3.1 - 3.2	Turineis								
<u>3.1</u>	Double track tunnelling in s	oft ground										
	No calculation in QOHSRP repor	t.										
	Assume 66% increase from C	OHSRP report unit co	st									
	Unit Cost 3.1 (QOHSRP) \$70,000 / m											
	\$70,000 x 1.66%	= \$116,200	Use \$120,0	00 / m								
<u>3.2</u>	2 Double track tunnelling in rock											
	No calculation in QOHSRP repor	t.										
	Assume 66% increase from C	OHSRP report unit cos	st									
	Unit Cost 3.1 (QOHSRP)	\$47,747 / m										
	\$47,747 x 1.66%	= \$79,260	Use \$80,000 / m									
		ı		I								
000	EcoTrain	By: B.K., MMM Group L	imited	Continued:								

Date: 2009-09-30				Paga	: 1 of 1						
	"", 0, 1, 6, 11, 1	0 10	" 0 '	raye	. 1 01 1						
-	oility Study of a High	=									
	Québec City – Winds										
Del. 6 : Updating Construction and Oper	rating Costs	Develop	ment of Cap	ital Unit Co	st, CAD						
Technology: X E300+	Sub-System: Sector:		Bridges, Viadu Construction/I		nnels						
x F200+	Item:	_	Tunnels								
	Sub-item:	3.3	Modif. To Mt-F	Royal tunnel	, Montréal						
The existing 5,5 km long Mt-Royal to Jean-Talon Street, in the Town of and no emergency exits.											
Given that the trains will be air con without any ventilation system in the		oowered, H	SR should be	allowed to c	irculate						
But, according to NFPA-130 (Standard for Fixed Guideway Transit and Passenger Rail Systems), the tunnel should be provided with emergency exits at maximum spacing of 762 m.											
To achieve this, a parallel evacuation tunnel should be built all along the existing one and not far away, to permit evacuation from the existing tunnel, with connecting tunnels every 750 m. This 5 m dia. Tunnel could allow busses to circulate in one direction to rescue evacuated passengers.											
An example of the proposed arrangement could be the Katzenberg twin tunnels in Germany; in the illustration below, one of the two tubes could be the existing Mount Royal tunnel.											
	Cross Section with cross pass	sage									
	opt sign A Safety Lock	1,10									
FIGURE 5 : CRO	SS SECTION OF THE KATZENBERG	- TUNNEL (DB, N	EAR BASEL)10								
Two similar projects can be used a	as reference for pricing:										
- Oslo-Ski, Norway : 17,85 ki	m, built in 2008 with the records of 52 000 CAE		_	ethod (NOT)	, at an						
3,	ı, buit in 2009 with a tunn 42 000 CAD/m for civil w	•	achine (TBM)	, at an avera	age unit						
Given the relatively short length of of that cost for one 5 m tube and a would get a unit cost of 32 000 \$/m	cross passage every 75			•	-						
	diam. tunnel plus cross p (north of Maisonneuve S n), minimal lighting and e	St and north	of Jean-Taloi		155 M\$ 7 M\$ 3 M\$						
*: From Maisonne	euve St to Jean-Talon St			=	165 M\$						
EcoTrain	By: JC.T., Dessau and O.G., DBI		Continued:]						

Date: February 1994								Page:	: 1 of 4
Upo			•	idy of a H City – Wi	•		ervice		
Del. 6 : Updating Const	ructio	n and C	perating	Costs	Dev	elopment	of Capital	Unit Cost,	, CAD
Technology:	х	E300+	Sul	o-System:	D	Grade Sep	arations		-
	_			Sector:		Construction			
	Х	F200+		Item: Sub-item:		New Rural 1.1 to 1.3	G.S.		
				oub item.					
1992-95			n 1.1		n 1.2	Item			
				ural over 2 acks		ural over 4 icks	4 Lane Ru Tra		
	Unit	Price \$/unit	Q	\$	Q	\$	Q	\$	
1. Excavation	m³	5	1760	8 800	1760	8 800	2140	10 700	
2. Borrow	m³	5	145 730	728 650	145 730	728 650	182 560	912 800	
3. Hot Mix	t	60	2 265	135 900	2 365	141 900	4 680	280 800	
4. Gran 'A'	t	10	6 820	68 200	6 820	68 200	9 340	93 400	
5. Gran 'B'	t	8	10 925	87 400	10 925	87 400	16 000	128 000	
6. Guide Rail	m	75	1 540	115 500	1 540	115 500	1 540	115 500	
Sub Total				1 144 450		1 150 450		1 541 200	
7. Minor Items 10%				114 450		115 050		154 120	
Total Roadwork				1 258 900		1 265 500		1 695 320	
Structure									
8. Standard Conditions	m²	1100	500	550 000	945	1 039 500	800	880 000	
9. Diff. Fnd. Conditions	m²	1265	500	632 500	945	1 195 425	800	1 012 000	
Total Cost		.							
Standard Conditions				1 808 900		2 305 000		2 575 320	
Difficult Fnd. Conditions				1 891 400		2 460 925		2 707 320	
Retained value *				2 200 000		2 800 000		3 100 000	
* : 20±% added to total cost to	o comp	pensate	for low bor	row unit pr	ice				
EcoTrain By				Lavalin and	Delcan			Continued:	х

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Date: February 1994								Page:	2 of 4
Upo	lated	Feasil	bility Stu	ıdy of a H	ligh Spe	ed Rail S	ervice		
		in the	Québec (City – Wi	ndsor C	orridor			
Del. 6 : Updating Constr	ructio	n and C	perating	Costs	Dev	/elopment	of Capital	Unit Cost,	CAD
Technology:	х	E300+	Sul	b-System:	D	Grade Sep	parations		
				Sector:		Construction			
	х	F200+		Item:		New Rural	G.S.		
			;	Sub-item:		1.4 to 1.5			
1992-95			Item 1.4		Iten	n 1.5			
.002 00			4 Lane Ru	ural over 4	4 Lane Di	v. Freeway			
	Unit	Price	Tra Q	acks \$	over 2	Tracks			
	Unit	\$/unit	G.	Ψ	G.	Ψ			
1. Excavation	m³	5	2140	10 700	3590	17 950			
2. Borrow	m³	5	182 560	912 800	315 350	1 576 750			
3. Hot Mix	t	60	4 850	291 000	6 670	400 200			
4. Gran 'A'	t	10		93 400					
5. Gran 'B'	t	8	16 000	128 000	31 360	250 880			
6. Guide Rail	m	75	1 540	115 500	840	63 000			
Sub Total			1	1 551 400	l :				
7. Minor Items 10%]					245 230			
Total Roadwork	<u> </u>			1 706 540		2 697 510			
Structure									
8. Standard Conditions	m²	1100	1 150	1 265 000	920	1 012 000			
9. Diff. Fnd. Conditions	m²	1265	1 150	1 454 750	920	1 163 800			
Total Cost									
Standard Conditions	ļ			2 971 540		3 709 510	ļ		
Difficult Fnd. Conditions				3 161 290		3 861 310			
Retained value *				3 565 000		4 450 000			
* : 20±% added to total cost to	comp	ensate	for low bor	row unit pr	ice				
EcoTrain By: SNC-Lavalin and De							(Continued:	х

Date: June 2009 Page: 3 of 4 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor Del. 6: Updating Construction and Operating Costs **Development of Capital Unit Cost, CAD** Technology: E300+ **Grade Separations** Sub-System: D Sector: 4 Construction F200+ Item: New Rural G.S. 1.1 to 1.3 Sub-item: 2009 Item 1.1 Item 1.2 Item 1.3 2 Lane Rural over 2 2 Lane Rural over 4 4 Lane Rural over 2 Tracks Tracks Tracks Unit Price Q \$ Q \$ Q \$ \$/unit 1. Excavation ${\rm m}^{\rm 3}$ 10 1760 1760 17 600 2140 17 600 21 400 2. Borrow m^3 145 730 2 185 950 15 145 730 2 185 950 182 560 2 738 400 3. Hot Mix t 100 2 265 226 500 2 365 236 500 4 680 468 000 4. Gran 'A' 20 6 820 136 400 6 820 136 400 9 340 186 800 5. Gran 'B' 15 10 925 163 875 10 925 163 875 16 000 240 000 6. Guide Rail 120 1 540 184 800 1 540 184 800 1 540 184 800 m Sub Total 2 915 125 2 925 125 3 839 400 7. Minor Items 10% 291 513 291 153 383 940 Total Roadwork 3 206 638 3 216 278 4 223 340 Structure 8. Standard Conditions m^2 2500 500: 1 250 000 945 2 362 500 800: 2 000 000 9. Diff. Fnd. Conditions m^2 945 2 716 875 2875 500 1 437 500 800 2 300 000 **Total Cost** Standard Conditions 4 456 638 5 578 778 6 223 340 Difficult Fnd. Conditions 4 644 138 5 933 153 6 523 340 Retained value 5 570 000 6 230 000 4 460 000 EcoTrain By: B.K., MMM Group Limited Continued: Х

Date: June 2009								Page	: 4 of 4
Upo	lated	Feasil	bility Stu	idy of a H	ligh Spe	ed Rail S	Service		
		in the (Québec	City – Wi	ndsor C	orridor			
Del. 6 : Updating Constr	ructio	n and O	perating	Costs	Dev	/elopment	of Capital	Unit Cost,	CAD
Technology:	х	E300+	Sub-System: D Grade Separa			parations			
	_			Sector:		Construction			
	Х	F200+		Item:		New Rural	G.S.		
				Sub-item:		1.4 to 1.5			
0000			la a a	- 4 4	14.0.00	- 1 -		<u> </u>	
2009				n 1.4 ural over 4		n 1.5 v. Freeway			
				icks	over 2 Tracks				
	Unit	Price \$/unit	Q	\$	Q	\$			
1. Excavation	m³	10	2140	21 400	3590	35 900			
2. Borrow	m³	15	182 560	2 738 400	315 350	4 730 250			
3. Hot Mix	t	100	4 850	485 000	6 670	667 000			
4. Gran 'A'	t	20	9 340	186 800	14 350	287 000			
5. Gran 'B'	t	15	16 000	240 000	31 360	470 400			
6. Guide Rail	m	120	1 540	184 800	840	100 800			
Sub Total				3 856 400		6 291 350			
7. Minor Items 10%				385 640		629 135			
Total Roadwork				4 242 040		6 920 485			
Structure							-		
8. Standard Conditions	m²	2500	1 150	2 875 000	920	2 300 000			
9. Diff. Fnd. Conditions	m²	2875	1 150	3 306 250	920	2 645 000			
Total Cost									
Standard Conditions				7 117 040		9 220 485			
Difficult Fnd. Conditions				7 548 290		9 565 485			
Retained value				7 120 000		9 230 000			
EcoTrain	EcoTrain By: B.K., MMM Group Limited							Continued:	

Date: 2009-11-27	7				Page: 1 of 2
	Updat			h Speed Rail Servic	e
			Québec City – Wind		
Del. 6 : Updating Cons	truction	and Oper	ating Costs	Development of C	apital Unit Cost, CAD
Technology:	X	E300+	Sub-Systen		
	х	F200+	Secto Iten		separations, rural & urban
			Sub-iten	1: 1.7 and 2.5 Extra cost	for fills on sensitive clays
Alternative 1	: Const	ruction of	light fills with polystyr	ene	
Assume:	11 m h		·	de at the top) for a 2-land	e cross road
Fill area at ma:	x height	:	(60+12)*11/2 =	396 m²	
polystyrene vo	lume / a	pproach:	(396 - 60*1)*200/2 =	33 600 m³	
Unite price of p	oolystyre	ene :		105 \$/m³	
Total cost of po	olystyrei	ne per grac	le separation:	7 056 000 \$	
Less: cost of re	eplaced	normal fill	2 * 33 600 * 12 \$ =	-806 400 \$	
Net additional	cost p	er 2-lane g	rade separation:	6 249 600 \$ 7: 6 300 000 \$ per 2-la	ne grade separation
Increase for a			ration (7 m extra width): 0m/2 x 2 x(105-12)\$	1 432 200 \$	
Net additional	cost p	er 4-lane g	rade separation:	7 681 800	
			sa	/: <u>7 700 000</u> \$ per 4-la	ne grade separation
		15	T		
ECO ECO	Γra	in	By: Morteza Esfehani, DESSAU	ing., Ph.D. Continue	d: X

Date: 2009-11-27 Page: 2 of 2 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor Del. 6: Updating Construction and Operating Costs **Development of Capital Unit Cost, CAD** E300+ Technology: Sub-System: D Grade separation Construction Sector: 4 F200+ Item: 1 and 2 New grade separations, rural & urban Sub-item: 1.7 and 2.5 Extra cost for fills on sensitive clays Alternative 2 : Consolidation of clay deposit with vertical drains Assume: 60 m wide embankement base (12 m wide at the top) for a 2-lane cross road 12 m high 200 m approach length Extra fill for compensation of settlement: 4 m at max height of approach fill: 240 m2 0 m at beginning of approach fill: 0 m2 Total extra fill volume, 2 approaches: 35 200 m3 Unite price of extra fill material (borrow): 12 \$/m³ Total cost of fill: 422 400 \$/structure, 2-lane Min. vertical drain depth: 45 m Number of vertical drains per approach (at 1.2 m apart): 51,84 Vertical drain length per structure: 4 666 m Unite price of vertical drain (purchase + installation): 5 \$/m Vertical drain cost per km: 1 049 760 \$/structure, 2-lane Total cost per 2-lane structure: 1 472 160 \$ Say: 1 500 000 \$ Additional cost for 4-lane structure (7 m wider): 2*(7*4*200*12/2 + 7*200*45*5/1,44)504 700 \$ Total cost per 4-lane structure: 1 976 860 \$ Say: 2 000 000 \$ Recommanded solution: Alternative 2, Consolidation of clay deposit with vertical drains Unit Price D-4-1.7: Unit Price D-4-2.5: 1 500 000 \$ per 2-lane grade separation 2 000 000 \$ per 4-lane grade separation By: Morteza Esfehani, ing., Ph.D. **EcoTrain** Continued: **DESSAU**

Date: February 1994								Page:	:1 of 2
Upd			•	ıdy of a H City – Wi	• .	ed Rail S orridor	ervice		
Del. 6 : Updating Constr	uctio	n and C)perating (Costs	Dev	velopment	of Capital	Unit Cost	, CAD
Technology:	х	E300+	Sul	b-System:	D	Grade Sep	arations		
	- U			Sector:		Construction			
	Х	F200+		Item: Sub-item:		New Urbar 2.1 to 2 4	1 G.S.		
1992-95				n 2.1	Item 2.2		Item 2.3		Item 2.4
				/ High-ways lanes)		y High-ways nes) Dual	Major Hi (over 4	ighways I lanes)	Extra for Difficult
	Unit	Price \$/unit	Q	\$	Q	\$	Q	\$	Foundation Cond.
1. Borrow	m³	5	198 000	990 000	198 000	990 000	233 330	1 166 650	
2. Hot Mix	t	60	4 445	266 700	4 495	269 700	6 610	396 600	
3. Gran 'A'	t	10	5 640	56 400	5 640	56 400	8 670	86 700	ļ
4. Gran 'B'	t	8	14 100	112 800	14 100	112 800	25 000	200 000	<u> </u>
5. Guide Rail	m	75	1 540	115 500	1 540	115 500	1 540	115 500	<u> </u>
6. Curbs	m	32	1 880	60 160	1 880	60 160	3 760	120 320	
6. Sidewalks	m²	35	2 820	98 700	2 820	98 700	2 820	98 700	
Sub Total	ļ	<u> </u>		1 700 260		1 703 260		2 184 470	
8. Minor Items 30%	ļ	<u></u>		510 080		510 980		655 340	
Total Roadwork				2 210 340		2 214 240		2 839 810	
Structure									
9. Standard Conditions	m²	1100	800	880 000	1 090	1 199 000	1 160	1 276 000	
10. Diff. Fnd. Conditions	m²	1265	800	1 012 000	1 090	1 378 850	1 160	1 467 400	
11. Traffic Maintenance	ļ	<u> </u>		100 000		100 000		100 000	
12, Detours		<u> </u>		150 000		150 000		150 000	
13. Mitigations - Private Prope	rty	<u></u>		50 000		50 000		50 000	
Total Cost	ļ	<u></u>							
Standard Conditions	-			3 390 340		3 713 240		4 415 810	
Difficult Fnd. Conditions		<u> </u>		3 522 340		3 893 090		4 607 210	
Retained value *				4 068 000		4 456 000		5 300 000	200 000
* : 20±% added to total cost to	for low bor	row unit pri	ice						
EcoTrain			By: SNC-I	Lavalin and	l Delcan		(Continued:	Х

Date: June 2009								Page	:2 of 2	
Upd			•	ıdy of a H	•		ervice			
		in the	Québec (City – Wi	ndsor C	orridor				
Del. 6 : Updating Constr	uctio	n and C	perating	Costs	Dev	velopment	of Capital	Unit Cost	, CAD	
Technology:	Х	E300+	Sul	b-System:		Grade Sep				
	Y	F200+		Sector: Item:		Construction New Urban				
	<u>ث</u>	1 ZUU+		Sub-item:	_	2.1 to 2 4				
2009				n 2.1 y Hhwys (2-		m 2.2 ry Highways		n 2.3 Iways (over	Item 2.4 Extra for	
				anes)		nes) Dual	, ,	nes)	Difficult	
	Unit	Price \$/unit	Q	\$	Q	\$	Q	\$	Foundation Cond.	
1. Borrow	m³	15	198 000	2 970 000	198 000	2 970 000	233 330	3 499 950		
2. Hot Mix	t	100	4 445	444 500	4 495	449 500	6 610	661 000	ļ	
3. Gran 'A'	t	20	5 640	112 800	5 640	112 800	8 670	173 400	<u> </u>	
4. Gran 'B'	t	15	14 100	211 500	14 100	211 500	25 000	375 000	<u> </u>	
5. Guide Rail	m	120	1 540	184 800	1 540	184 800	1 540	184 800	ļ	
6. Curbs	m	50	1 880	94 000	1 880	94 000	3 760	188 000		
6. Sidewalks	m²	55	2 820	155 100	2 820	155 100	2 820	155 100		
Sub Total		<u> </u>		4 172 700		4 177 700		5 237 250		
8. Minor Items 30%		<u> </u>		1 251 810		1 253 310		1 571 175		
Total Roadwork		<u> </u>		5 424 510		5 431 010		6 808 425		
Structure	<u> </u>									
9. Standard Conditions	m²	2 500	800	2 000 000	1 090	2 725 000	1 160	2 900 000		
10. Diff. Fnd. Conditions	m²	2 875	800	2 300 000	1 090	3 133 750	1 160	3 335 000		
11. Traffic Maintenance				150 000		150 000		150 000		
12, Detours	<u> </u>			250 000		250 000		250 000		
13. Mitigations - Private Prope	rty			75 000		75 000		75 000		
Total Cost										
Standard Conditions		<u></u>		7 900 000		8 640 000		10 190 000		
Difficult Fnd. Conditions				8 200 000		9 040 000		10 620 000		
Retained value				7 430 000		8 160 000		9 710 000	350 000	
EcoTrain			By: B.K., I	MMM Grou	p Limited		(Continued:		

ate: February 1994								Page	:1 of 4
Upo	dated	l Feasi	bility Stu	dy of a H	ligh Spee	ed Rail Se	ervice		
		in the	Québec	City – Wi	ndsor Co	rridor			
Del. 6 : Updating Constr	uctio	n and O	perating (Costs	Dev	elopment	of Capital	Unit Cost	, CAD
Technology:	х	E300+	Sul	b-System:	D	Grade Sep	arations		
				Sector:		Construction			
	Х	F200+		Item:		Modificatio	n of Existir	ng G.S.	
				Sub-item:		3,1			
1992-95			Item	3.1a	Item	3.1b			
			4 Lane U	rban Road	Urban	Minor			
	Unit	Price	Q Over 4	tracks	Q	cation \$		I	1
	•	\$/unit		Ť		*			
1. Roadway	L.S.		L.S.	200 000	L.S.	60 000			
2. Detour	km	280 000	0,0	0	0	0			
Sub Total	ļ			200 000	2 365	60 000			ļ
Minor Items 10%	ļ			20 000	6 820	6 000			<u> </u>
Total Roadwork				220 000	10 925	66 000			
3. Structure		1100	1 090 Bridge Removal	1 199 000 100 000	0	0			
4. Existing Bridge									
Rehabilitation	m²	250	0	0	300	75 000			
5. Crossing Protect,									
Signals, etc.	EA.	250 000	0	0	0	0			
Total Cost				1 519 000		141 000			
Unit Cost for 3.1 assumed to	be th	i ne avera	ae of 3.1a	and 3.1b.					
	<u> </u>								
Average of 3.1a and 3.1b				•		830 000			
Retained value						•			
Retained value 830 000									

ate: February 1994								Page:	2 of 4
Upo	dated	l Feasi	bility Stu	dy of a H	ligh Spe	ed Rail Se	ervice		
		in the	Québec (City – Wi	ndsor Co	orridor			
Del. 6 : Updating Constr	uctio	n and O	perating (Costs	Dev	velopment	of Capital	Unit Cost,	CAD
Technology:	х	E300+	Sul	b-System:	D Grade Separations				
				Sector:	: 4 Construction				
	Х	F200+		Item:		Modificatio	n of Existin	ng G.S.	
				Sub-item:		3,2			
1992-95			Item	3.2a	Item	3.2b		1	
			4 Lane Rural over 4		4 Lane Di	v. Freeway			
	Unit	Price	Q I ra	acks \$	over 2	Tracks \$			
	O	\$/unit	<u> </u>	Ψ	ŭ	Ψ			
1. Roadway	L.S.		L.S.	100 000	L.S.	30 000			
2. Detour	km	280 000	0,7	196 000	0	0			
Sub Total	<u> </u>			296 000	2 365	30 000			
Minor Items 10%	<u> </u>	5		29 600	6 820	3 000			
Total Roadwork				325 600	10 925	33 000			
3. Structure		1100	500	550 000	0	0			
4. Existing Bridge									
Rehabilitation	m²	250	190	47 500	190	47 500			
5. Crossing Protect,	[
Signals, etc.	EA.	250 000	1	250 000	0	0			
Total Cost				1 173 100		80 500			•
Unit Cost for 3.1 assumed to	be th	ne avera	ge of 3.1a	and 3.1b.					•••••••••••••••••••••••••••••••••••••••
	<u> </u>								
Average of 3.1a and 3.1b	1					626 800			••••••
Retained value						627 000			
								<u>.</u>	
						Ī			
EcoTrain			By: SNC L	_avalin and	Delcan		(Continued:	Х

Date: June 2009								Page:	3 of 4
Upo	lated	l Feasi	bility Stu	dy of a H	ligh Spe	ed Rail Se	ervice		
		in the	Québec	City – Wi	ndsor Co	orridor			
Del. 6 : Updating Constr	uctio	n and O	perating (Costs	Dev	velopment	of Capital	Unit Cost,	CAD
Technology:	Х	E300+	Sul	b-System:		Grade Sep			
		F000 -		Sector:				~ C C	
	X	F200+		Item: Sub-item:				ig G.S.	
						,			
2009				3.1a	Item 3.1b				
				rban Road tracks		n Minor ication			
	Unit	Price \$/unit	Q	\$	Q	\$			
1. Roadway	L.S.		L.S.	500 000	L.S.	150 000			
2. Detour	km	700 000	0,0	0	0	0			
Sub Total				500 000	2 365	150 000			
Minor Items 10%				50 000	6 820	15 000			
Total Roadwork				550 000	10 925	165 000			
3. Structure		2500	1 090 Bridge Removal	2 725 000 250 000		0			
Existing Bridge Rehabilitation	m²	600	0	0	300	180 000			
5. Crossing Protect,									
Signals, etc.	EA.	300 000	0	0	0	0			
Total Cost				3 525 000		345 000			
	<u> </u>								
Unit Cost for 3.1 assumed to	be th	ie avera	ge of 3.1a	and 3.1b.					
Average of 3.1a and 3.1b						1 935 000			
Retained value						1 940 000			
EcoTrain			By: B.K., I	MMM Grou	p Limited		(Continued:	х

Date: June 2009					Page:	4 of 4			
Upo	dated	l Feasi	bility Stu	idy of a H	igh Spe	ed Rail S	ervice		
		in the	Québec	City – Wi	ndsor Co	orridor			
Del. 6 : Updating Constr	uctio	n and O	perating (Costs	Dev	velopment	of Capital Unit Cost, CAD		
Technology:	х	E300+	Sul	b-System:	D Grade Separations				
				Sector:					
	Х	F200+		Item:		Modificatio	n of Existin	ig G.S.	
				Sub-item:		3,2			
2009				3.2a	ltem	3.2b			
2000			4 Lane Ri	ural over 4	4 Lane Di	v. Freeway			
	Unit	Price	Q I ra	acks \$	over 2	Tracks			
	Oiiit	\$/unit	· ·	¥	· ·	Ψ			
1. Roadway	L.S.		L.S.	250 000	L.S.	75 000			
2. Detour	km	700 000	0,7	490 000	0	0			
Sub Total				740 000	2 365	75 000			
Minor Items 10%				74 000	6 820	7 500			
Total Roadwork				814 000	10 925	82 500			
3. Structure		2500	500	1 250 000	0	0			
4. Existing Bridge									
Rehabilitation	m²	600	190	114 000	190	114 000			
5. Crossing Protect,									
Signals, etc.	EA.	300 000	1	300 000	0	0			
Total Cost				2 478 000		196 500			
	<u> </u>								
Unit Cost for 3.1 assumed to	be th	ne avera	ge of 3.1a	and 3.1b.					
Average of 3.1a and 3.1b						1 337 250			
Retained value						1 340 000			
EcoTrain			By: B.K., I	MMM Grou	p Limited		(Continued:	
PEREC. WINOSO									

Date: June 2009								Page:	1 of 1
Upd				dy of a Hi City – Wir		eed Rail S Corridor	ervice		
Del. 6 : Updating Constr	uctio	n and C	perating (Costs	Development of Capital Unit Cost, CAD				CAD
Technology:	х	E300+ F200+	Sector:		D 4 5	Grade Sep Construction Closure ar			
2009		Closure and	Item 5 Closure and Diversion of Road						
	Unit	Price \$/unit	Q	\$					
1. Excavation	m³	10	10 000	100 000					
2. Hot Mix	t	100	1 524	152 400	•••••				
3. Gran 'A'	t	20	4 500	90 000					
4. Gran 'B'	t	15	8 750	131 250					
5. Removal of Detour	L.S.	N/A	1	40 000					
Total Cost				513 650					
Retained value				520 000					
EcoTrain			By: B.K., N	имм Group) Limite	d	(Continued:	

Date: 93.04.01			Page: L of L					
QUE	BEC-ONTARIO HIGH UNIT COSTS FOR PR							
Technology: 및	300+ kph - new R/W 300+ kph - exist. R/W 200+ kph - exist. R/W	Sub-system: Sector: Item:	E - OTHER ALLOY, WORK 4 - CONSTRUCTION 1 - TRACK REHOWAL					
Geographical Variati	on ? 년 no 미 yes If yes	, indicate segments ap	oplicable:					
Price developed by	/ CANARAIL							
Work consists of 3 steps - picking up other track material, picking up rail, and picking up ties. Each has been estimated separately on the assumption of lifting track built with 115 lb/yd rail and are presented below: Other Track Materials: (tie plates, spikes, rail anchors, joint bars)								
Other Frack Mate	riais: (tie plates, spikes, ra	i anchors, joint bars)	······					
40 tonnes/k	m @ \$143 /tonne \$200/tonne		\$ 5,720 \$8,000					
Rail:		7.11.11.11.11.11.11.11.11.11.11.11.11.11						
115 tonnes	/km @ \$43.40/tonne \$110/tonne		\$ 4,991 \$12,650					
2000 ties/ki	n @ \$2.65 /tie	The state of the s	\$ 5,300 \$13,000					
	\$6.50/tie							
Contractor's over	head and profit: @	32% of above cost	\$ 5,123 \$10,768					
	ТОТА	L (/km)	\$ 21,134 \$44,418 Use \$45,000/km					
Prepared by:			continued \Box					

Date: 93.04.20			Page: c	of	
QUE	BEC-ONTARIO HIGH UNIT COSTS FOR PR			2000 C	
Technology: 모	300+ kph - new R/W . 300+ kph - exist. R/W 200+ kph - exist. R/W	Sub-system: Sector: Item:	E - OTHER ACE 4 - CONSTRU 2 - NEW ACE		
Geographical Variati	ion ? 🗹 no 🔲 yes If yes	, indicate segments a	oplicable:		
Price developed b	y SNC-Lavalin + DELCAN	+ CANARAIL			
Subgrade:					
Grading @	2 40,000 cu.m/km @ \$ 5.00	/cu.m. \$10/cu.m.	\$ 200,000	\$400,000	
,	t @ 1,600 cu.m/km @ \$ 15		24,000	\$35,200	
Other cost	s @ 15%		<u>33,600</u>	\$65,280	
٠.		Total		\$ 257,600	500,480
Track Materials:					
Rail @ 120) tonnes/km @ \$689/tonne	\$870/tonne	\$ 81,600	\$104,400	
	s @ 40 tonnes/km @ \$850/	·	34,000	\$42,000	
Wood ties	@ 2,000/km @ \$32.00 /tie	\$39/tie	64,000	\$78,000	
Ballast @	2080 m ³ /km @ \$21.37/m ³	\$34/cu.m.	44,400	\$70,720	
Turnouts -	assume 2/km @ \$46,000/t	urnout \$60,000/turn	out <u>92,000</u>	\$120,000	
		Total		\$ 316,000	\$415,120
Track Constructi	on: (overhead and profit al	ready included in unit	prices)		
Build 1 km	n of track @ \$44,171 /km	55,200/km	\$ 44,170	\$55,200	
	outs - 2 @ \$4,680 /turnout		9,36 0	\$12,200	
Ballast and	d surface 2080 m³/km @ \$	8.47/m ³ \$14/cu.m.	17,620	\$29,120	
		Total		\$ 71,150	\$96,520
	тоти	AL (/km)	Φ.	\$ 644,750	
			Use \$1,05	50,000/km	
Prepared by:			continu	ued 🔲	

Date:	the Table 10 to		Page: <u>l</u> of <u>l</u>					
QUI	EBEC-ONTARIO HIGI UNIT COSTS FOR PR		ROJECT					
Technology:	300+ kph - new R/W 300+ kph - exist. R/W 200+ kph - exist. R/W	Sub-system: Sector: Item:	E - OTHER ACC. WORKS 4 - CONSTRUCTION 3 - RAIL/RAIL 5/5					
Geographical Variation	n ? 🔲 no 🔲 yes if yes, ind	dicate segments applica	ble:					
3.2 i) Rail/Rail (Grade Separation in Rural Ar	ea						
•								
At crossings	with existing rail tracks, the	HSR tracks will be car	ried over or under the					
existing trac	ks with earthworks to be co	vered by linear measure	ment under Sub-system					
В.		A SANIAL						
		13.5						
Assume an a	average bridge length of 30m	n and a width of 13 m f	for 2 tracks,					
	13.5							
cost of bridg	cost of bridge structure = $13 \times 30 \ $							
	= \$ /02, ()00 [\$1,215,000]						
Allow 1504	for soil divorsions, misselless	valle temperativ works	ota					
Allow 15% I	for rail diversions, miscellane = \$800,0							
	_ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	03c ψ1,400	5,000					
3.1 ii) Rail/Rail (Grade Separation in Urban A	rea						
	The second secon	13.5						
Assume an a	average bridge length of 36n	n and a width of 13 m	for 2 tracks,					
	13.5							
cost of bridg	je structure = 13 x 3	6 @ \$ 1,800 /m² \$3,00	00/sq.m.					
	= \$ 842,	1 00 \$1,458,000						
15%								
Allow 20%	for rail diversions, retaining :	structures in constraine	d areas, miscellaneous					
temporary w	vorks, etc. = \$1, 000,000 s e	Use \$1,680,000						
Prepared by:			continued \Box					

Date: 20	009-09-17					Pag	je: 1 of 2
	Updated Fe	easibility Study o	f a Hi	gh Speed Ra	il Service		
	in t	the Québec City	– Win	dsor Corrido	or		
Del. 6 : Updating	Construction and	Operating Costs		Developmen	t of Capital Unit C	ost, C	CAD
Technology: x	E300+	Sub-System:	F	Track			
x	F200+	Sector: Item:	4 1	Construction Ballast track o	n earthworks		
	1 2001	Sub-item:	•	none			
1,1	Rail: UIC 60	Mass:	60 kg	/m rail			
1,1		Steel price: 1 555	\$/t	x 60/1000	per m rail	\$	93
1,1		Procurement/Deliv	very:		per m rail	\$	3
1,1					Total per m rail	\$	96
1,1	Total cost for	1 m of double tra	ck:		Say:	\$	385
40 75							
1,2	Tie	Precast monobloo	k con	crete tie			
1,2		approx.: 380 kg/ tie			per m track	\$	196
1,2		Procurement/Delivery: per m track \$					
1,2	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1						
1,2	lotal costs to	r one m double tr	аск:		Say:	\$	415
1,3	Costoning	Type: Jean, 200			nor m trook	φ	150
1,3	Fastening	Type: loarv 300 Procurement/Deliv	verv ·		per m track		158
1,3		r rodaromony Bon	voly .	7	per m track otal per m track		1 574
1,3	Total costs fo	r one m double tr	ack:	'	Say:		318
.,0	10141 00010 10				Ody.	Ψ	010
1,4	Ballast	H igh quality crush	ed an	d washed gra	nite		
1,4		Price: 16,3 \$/t		3			
1,4	a:= 0.5m shoulder	+ 1.3m half tie + 5m d		centerline + 1.3r	n half tie +0.5m shoເ	ılder =	8.6m
1,4	a=8.6m; h=0.6m						
1,4	Trapezoid area=	/					
1,4	1.65 t/m³ - new b		<u>9,4</u>	t/m double t	<u>rack</u>		
1,4					per m track	\$	77
1,4					per m track	\$	70
1,4	Total costs fo	r one m double tr	ack:		Say:	\$	295
EcoT	rain	By: H. B., DBI			Continued:		>

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	Updated Fe	easibility Study of a	High Speed Ra	il Service				
	in t	the Québec City – V	Vindsor Corrido	or				
Del. 6 : Updating	Construction and	d Operating Costs	Developmen	t of Capital Unit Co	st, CAD			
Technology: x	E300+	Sub-System:	F Track					
_	_ 		4 Construction					
x	F200+	Item: Sub-item:	 Ballast track o none 	n earthworks				
		Jub-itelii.	Hone					
1,5	Track Constru	uotion						
1,5	Track Constit	iction						
	Costs for track	construction include	all works to lay ne	ew tracks and				
1,5	are also taking	welding and initial rai	I grinding into ac	count.				
1,5	T. 1.1.				_			
1,5	lotal costs to	r one m double tracl	K:	•	\$ 464			
	Overall costs	s of ballast track or	<u>n earthworks</u>					
	\$ 385	Rail per m double tra	ıck					
	\$ 415	Ties per m double tra	ack					
	\$ 318	Fastening system pe	r m double track					
	\$ 295	Ballast per m double	track					
	\$ 464	Track construction m	double track					
	\$ 1877	Overall per m double	track					
	Total costs fo	r one m double tracl	K :	Ş	1 877			
				_				
		HSO/CR-Eurotrain; HSR B						
LC	• • •	lecide on investment for tra rrent DB Procurement data	-	nsult 1999;				
In	Inflation 2% per vear: Exchange rate CAN - EUR: 1.566							
	120	D 11 D ==:						
ECOT	rain	By: H. B., DBI		Continued:				

2009-09-17 Date: Page: 1 of 2 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor Del. 6: Updating Construction and Operating Costs **Development of Capital Unit Cost, CAD** E300+ Track Technology: x Sub-System: F Construction 4 Sector: F200+ Item: 2 Ballastless track on earthworks Sub-item: none 1,1 Rail: UIC 60 Mass: 60 kg/m rail 1,1 Steel price: 1 555 \$/t x 60/1000 93 per m rail \$ Procurement/Delivery: 1,1 per m rail \$ 3 1,1 Total per m rail \$ 96 1,1 Total cost for 1 m of double track: Say: \$ 385 1,2 Tie Precast concrete tie for balastless track 1,2 approx.: 380 kg/tie per m track 210 1,2 Procurement/Delivery: per m track 11 1,2 Total per m track 221 1,2 Total costs for one m double track: Say: \$ 442 1,3 **Fastening** Type: loarv 300 per m track \$ 158 1,3 Procurement/Delivery: per m track \$ 1 1,3 601 Total per m track \$ 1,3 Total costs for one m double track: Say: \$ 318 1,4 Bonded support layer and drainage 1,4 Costs for bonded support layer construction include material, transport and works. 1,4 1,4 Total costs for one m double track: 315 **B EcoTrain** By: H. B., DBI Continued:

Date: 20	009-09-17					Page: 2	2 of 2	
	•	easibility Study o		• .				
	in	the Québec City	– Win	dsor Corrido	r			
Del. 6 : Updating	Construction and	Operating Costs		Developmen	t of Capital Unit	Cost, CAD)	
Technology: x	E300+	Sub-System:	F	Track				
v	F200+	Sector: Item:	4 1	Construction Rallastless tra	ck on earthworks			
X	F200+	Sub-item:		none	ck on earnworks			
1,5	Concrete slab	manufacturing		Type: Rheda				
1,5	Costs for const	ruction include sett	ing up	sleepers with	a lattice truss,			
1,5		g, transport and wo hey are also taking						
1,5	grinding.	ney are also taking	ппо а	ccount welani	g and initial rail			
1,5	Total costs for	one m double tra	ck:			\$	1 010	
	Overall costs	of ballastless tr	ack o	on earthwork	<u>(S</u>			
	\$ 385	Rail per m double	track					
	\$ 442	Ties per m double	track					
	\$ 318	Fastening system	per m	double track				
	\$ 315	Bonded support la	yer ar	nd drainage				
	\$ 1010	Concrete slab mar	nufact	uring m double	e track			
	\$ 2 470	Overall per m dou	ble tra	ck				
	-							
	Total costs for	one m double tra	ick:			\$	2 470	
Note: So	ource: Cooperation F	ISO/CR-Eurotrain; HSF	R Beiiin	g - Shandhai:				
LO	LCC as approach to decide on investment for transportation; DE-Consult 1999;							
	Crosschecked with current DB Procurement data; Inflation 2% per year; Exchange rate CAN - EUR: 1.566							
EcoTi	rain	By: H. B., DBI			Continued	:		

2009-09-17 Date: Page: 1 of 2 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor Del. 6: Updating Construction and Operating Costs **Development of Capital Unit Cost, CAD** Track Technology: x E300+ Sub-System: F Construction Sector: 4 F200+ Item: Ballastless track in tunnels Sub-item: none 1,1 Rail: UIC 60 Mass: 60 kg/m rail 1,1 Steel price: 1 555 \$/t x 60/1000 93 per m rail: \$ 1,1 Procurement/Delivery: per m rail: \$ 3 1,1 per m rail Total: \$ 96 1,1 Total cost for 1 m of double track: 385 Say: 1,2 Tie Precast concrete tie for balastless track 1,2 approx.: 380 kg/tie 210 per m track 1,2 Procurement/Delivery: per m track 11 1,2 Total per m track 221 1,2 Total costs for one m double track: Say: 442 1,3 **Fastening** Type: loarv 300 per m track \$ 158 1,3 Procurement/Delivery: per m track \$ 1 1,3 Total per m track \$ 601 1,3 Total costs for one m double track: Say: \$ 318 1,4 Concrete slab manufacturing Type: Rheda 1,4 Costs for construction include setting up sleepers with a lattice truss, concrete casting, transport and works for installation of the track 1,4 components. They are also taking into account welding and initial rail 1,4 grinding. Total costs for one m double track: 1,4 1 010 \$ **EcoTrain** By: H. B., DBI Continued:

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Updated F	easibility Study of a High Speed Ra	il Service				
in	the Québec City – Windsor Corrido	or				
Del. 6 : Updating Construction and	d Operating Costs Developmen	t of Capital Unit Cost, CAD				
Technology: X E300+	Sub-System: F Track					
× F200+	Sector: 4 Construction Item: 3 Ballastless tra	ck in tunnels				
X F200+	Sub-item: none	CK III turiileis				
1,5 Savings From	Reduced Tunnel Cross Section					
1,5						
1,5 Due to smaller construction height of ballastless track in tunnels compared to ballast track, the cross section of tunnels can be reduced.						
1,5	aliast track, the cross section of turiners	can be reduced.				
1,5 Total costs fo	r one m double track:	\$ -142				
Overall costs	s of ballastless track in tunnels					
\$ 385	Rail per m double track					
\$ 442	Ties per m double track					
\$ 318	Fastening system per m double track					
\$ 1 010	Concrete slab manufacturing m double	e track				
\$ -142	Savings per m double track	_				
\$ 2013	Overall per m double track					
Total costs fo	r one m double track:	\$ 2013				
	HSO/CR-Eurotrain; HSR Beijing - Shanghai; ecide on investment for transportation; DE-Con:	sult 1999;				
Crosschecked with cu	rrent DB Procurement data; Exchange rate CAN - EUR: 1.566					
illiadon 270 por your,						
EcoTrain	By: H. B., DBI	Continued:				

Date: 20	009-09-17					Page: 1	l of 2
	•	easibility Study o		• .			
	in	the Québec City	– Win	dsor Corrido	or		
Del. 6 : Updating	Construction and	Operating Costs		Developmen	t of Capital Unit C	ost, CAD)
Technology: x	E300+	Sub-System:		Track			
<u> </u>	F200+	Sector: Item:		Construction Rallastless tra	ck on long bridges	(> 25 m)	
x	1 200+	Sub-item:	4	none	on on long bridges	(> 20 111)	
1,1	Rail: UIC 60	Mass:	60 kg	/m rail			
1,1		Steel price: 1 555	\$/t	x 60/1000	per m rail:	\$	93
1,1		Procurement/Deliv	very:		per m rail:	\$	3
1,1					per m rail Total:	\$	96
1,1	Total cost for	1 m of double trac	ck:		Say:	\$	385
1,2	Tie	Precast concrete	tie for	balastless tra	ack		
1,2		approx.: 380 kg/ti	е		per m track		210
1,2		Procurement/Deliv	very:		per m track		11
1,2				-	Total per m track		221
1,2	Total costs fo	r one m double tra	ack:		Say:		442
1,3	Fastening	Type: loarv 300			per m track	\$	158
1,3		Procurement/Deliv	very:		per m track	\$	1
1,3				-	Total per m track	\$	601
1,3	Total costs fo	r one m double tra	ack:		Say:	\$	318
1,4	Concrete slab	manufacturing		Type: Rheda			
1,4		ruction include sett	• .	•			
1,4		ig, transport and wo hey are also taking					
1,4	grinding.						
1,4	Total costs fo	r one m double tra	ack:			\$	4 040
EcoTi	rain	By: H. B., DBI			Continued:	•	>
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ate:	2009-09-	17					Page: 2 of 2
	U	pdated Fe	easibility Study o	f a Hi	gh Speed Ra	il Service	
		in [†]	the Québec City	- Wir	dsor Corrido	r	
Del. 6 : Upda	ating Constr	uction and	Operating Costs		Developmen	t of Capital Unit Co	st, CAD
Technolog	yy: X E	E300+	Sub-System:	F	Track		
		-000	Sector:	4	Construction	ok on long bridges (>	25 m)
	Х	F200+	Item: Sub-item:	1	none	ck on long bridges (>	25 111)
	Over	all agata	of ballootloop tra	م ماد د	an lana huida		
	<u>Over</u>	an costs	of ballastless tr	ack (on long bridg	<u>les</u>	
	•	225	D.11	. ,			
	\$		Rail per m double				
	\$		Ties per m double				
	\$		Fastening system				
	\$		Concrete slab mar			e track	
	\$	5 185	Overall per m doul	ole tra	ıck		
	Tatal		ana wa daukia kwa	ale.		Г.	
	lotai	costs for	one m double tra	CK:		\$	5 18
Note:			SO/CR-Eurotrain; HSF			ault 1999	
Note:	LCC as ap Crossched	proach to de ked with cur	ecide on investment for rent DB Procurement o	transp lata;	ortation; DE-Cons	sult 1999;	
Note:	LCC as ap Crossched	proach to de ked with cur	ecide on investment for	transp lata;	ortation; DE-Cons	sult 1999;	
	LCC as ap Crossched	oproach to decked with cur % per year; E	ecide on investment for rent DB Procurement o	transp lata;	ortation; DE-Cons	sult 1999; Continued:	

ate:	2009-08-05			F	Page: 1 of 1
	Updated Fea	asibility Study o	f a High Speed Ra	ail Service	
	in th	ne Québec City	 Windsor Corride 	or	
Del. 6 : Updati	ng Construction and C	Operating Costs	Developmer	nt of Capital Unit Co	st, CAD
Technology:	E300+	Sub-System:	F Track		
- -		Sector:	4 Construction		
	x F200+	Item:	5 Sub Ballast M	ats	
		Sub-item:	none		
Sub ba	1:1 .5	(\rightarrow Pre (2,6)	Fastening system Ficast concrete tie Film x 0,2m x 0,3m) Est shoulder 0,5 m Est shoulder 0,5 m Est shoulder 0,5 m	es
Tunou		i where necessar	y and for ballast pro	ntection on structure	5
Type:	sub ballast mat				
approx:	11	m² / m			
Optional	For ballast track	only			
Costs: Total costs	s for one m double tra	ck:			2 140 \$
Note:	Source: Cooperation HS LCC as approach to dec Crosschecked with curre Inflation 2% per year; Ex	cide on investment for ent DB Procurement	r transportation; DE-Cordata;	nsult 1999;	
Ecc	oTrain	By: H. B., DBI		Continued:	

	8-05				Page: 1 of 1
		sibility Study o			
Del. 6 : Updating Cons	truction and O	perating Costs		Developmen	t of Capital Unit Cost, CAD
Technology: X	E300+ F200+	Sub-System: Sector: Item: Sub-item:	F 4 6	Track Construction Noise Absorbe	er for balastless track
HO	1	1301	Nois	se absorber	

177 \$

Continued:

Optional

Costs:

Note:

EcoTrain

For ballastless track only

Source: Cooperation HSO-Eurotrain; HSR Beijing - Shanghai;

By: H. B., DBI

Crosschecked with current DB Procurement data; Inflation 2% per year; Exchange rate CAN - EUR: 1,566

LCC as approach to decide on investment for transportation; DE-Consult 1999;

Total costs for one m double track (estimation):

Date:	2009-08-05					Page: 1 of 1
	-	asibility Study o		•		
Dol 6 : Undati	IN I ng Construction and	the Québec City	– vvir		or t of Capital Unit (Cost CAD
-	_	<u></u>		Track	t of Capital Unit C	COST, CAD
Technology	E300+	Sub-System: Sector:	F 4	Construction		
	× F200+	Item:	7	Turnouts (dev	iation speed 60 km	ı/h)
		Sub-item:		none		
Type:	Turnout for sid	e protection and co	onnec	ctions to e.a. v	ards.	
.)				, and the engine		
	Radius of devia	ation		500	m	
	Allowed deviat	ion speed of :		60	km / h	
	approx. 90 m	length				
	Assessment in	cludes procureme	nt, de	livery and inst	allation of	
		ab track and ballas		-		
Costs:	_					
Total cost	s for one Turnout:					200 000 \$
Note:	Source: DB KoRII 808	3.0212 Listing of charac	cteristi	c unit costs for ra	ilway projects,	
I VOLG.	1998;	rrent DB Procurement			· · · · ·	
		Exchange rate CAN -		.566		
_	ne 22 negy	1				
ECC	oTrain	By: H. B., DBI			Continued:	

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	•	sibility Study of	_	-		
Dol 6 . Undetir	In tr	e Québec City -				Coot CAD
-		·		ack	t of Capital Unit	COSI, CAD
Technology:	X E300+	Sub-System: Sector:		onstruction		
	x F200+	Item:		•	iation speed 100 k	m/h)
		Sub-item:	no	one		
Type:	Turnout for cros	s overs and static	n platfo	rms		
	Radius of deviat	ion		1200	m	
	Allowed deviation	n speed of :		100	km / h	
	approx. 130 m	ength				
		ludes procuremer		ery and inst	allation of	
	turnouts; for sla	o track and ballas	t track			
Costs:						
	s for one Turnout:					310 000 \$
. 3.4. 00010						3.0 σσσ φ
Note:	Source: DB KoRII 808.0	0212 Listing of charac	teristic ur	it costs for ra	ilway projects,	
	1998; Crosschecked with curr					
	Inflation 2% per year; E	xchange rate CAN - E	EUR: 1.56	6		
△ Γ	Train	By: H. B., DBI			Continued:	$\overline{}$
OURREC - WINDSON ECC	Train	טע, ה. ס., טסו			Continued:	

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	Updated Fea	sibility Study o	f a H	igh Speed Ra	ail Service	
	in th	e Québec City	– Wir	ndsor Corrido	or	
Del. 6 : Updatir	ng Construction and (Operating Costs	Development of Capital Unit Cost, CAD			
Technology:	x E300+	Sub-System:	F	Track		
	F000	Sector:	4	Construction Switch Heaters	6	
	× F200+	Item: Sub-item:	9	none	5	
Type:	switch heating e	quipment for tur	nouts,	to prevent ma	alfunction due to	snow
	between switch	points and stock	rails	and at the mov	able point frogs	
Costs:						
Total costs	s for equipment at on	e turnout:				
Switch 1200	0 - 1:18,5 / 500 - 1:12					130 000 \$
Switch 190	- 1:9					100 000 \$
Note:	Source: DB KoRII 808.0	212 Listing of chara	cteristi	c unit costs for ra	ilway projects,	
	1998; Crosschecked with curr	ent DB Procuremen	t data;			
	Inflation 2% per year; E			1.566		
Ecc	Train	By: H. B., DBI			Continued	: [

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	-	sibility Study o		•		
		e Québec City	– Wir			
Del. 6 : Updatin	g Construction and (Operating Costs		Developmen	t of Capital Unit	Cost, CAD
Technology:	x E300 +	Sub-System:	F	Track		
	Г	Sector:	4	Construction	intion anough 10 km	/l-\
	x F200+	Item: Sub-item:	10	none	iation speed 40 kr	n/n)
Type:	Radius of deviation Allowed deviation approx. 50 m le	n speed of :	nt, de	190 40 livery and inst	m km / h	
Costs: Total costs Note:	for one Turnout: Source: DB KoRII 808.0	0212 Listing of chara	cteristic	c unit costs for ra	ilway projects,	140 000 \$
S Fco	1998; Crosschecked with curr Inflation 2% per year; E			.566	Continued	· 🗀

OUFBEC - WINDSOR

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U	pdated Fea	sibility Study of a	High Speed Ra	ail Service	
	in th	e Québec City – W	indsor Corrido	or	
Del. 6 : Updating Const	ruction and (Operating Costs	Developmen	t of Capital Unit Co	st, CAD
Technology: x	E300+	Sub-System: G			
	F200+	Sector: 4	Construction	enary System (OCS)	
Ц	F200+	Item: 1 Sub-item: 1.			
			<u> </u>	<u> </u>	
Delivery, installation a	and testing of				
,	-				
OCS at grade up to	350 km/h				
cost per km single lin		ent structure			
	•				
Catenary (CW, CatW	/, etc)			\$130 000	
- 1		contact wire, messeng	er wire, dropper, s	stitchwire, tensioning	device
Addional Wires				\$86 000	
Supply, delivery and i	installation of	additional wires includi	ng feeder return o	cable and electrical co	onnectors
Mechanical Equipme	nt			\$260 000	
Supply, delivery and	installation of	mechanical equipment	including suppor	ts, masts, cantelever	
Electrical Equipment				\$65 000	
		electrical equipment in	cluding disconned	ctor switches,	
earthing switches, ins	sulators				
Total				\$541 000	
Source: DB AG - DB		·			
€/CAD	1,566	2009-06-15			
EcoTrain	ו	By: Roger Stöcker, DE	l	Continued:	

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Updated Fe	asibility Study of a High Speed Ra	ail Service
in t	he Québec City – Windsor Corrid	or
Del. 6 : Updating Construction and	Operating Costs Developmen	t of Capital Unit Cost, CAD
Technology: X E300+	Sub-System: G Power Supply	
	Sector: 4 Construction	0 (000)
F200+	Item: 1 Overhead Cat Sub-item: 1.2 High Speed O	enary System (OCS) CS tunnel
	Odb-Rein. 1.2 High opens of	oo taliiloi
Delivery, installation and testing	of .	
Delivery, installation and testing	JI	
OOC in turned our to OFO long/h		
OCS in tunnel up to 350 km/h	da un abuncations	
cost per km single line - indepen	dent structure	
Only and (OM) Only (A)		\$130 000
Catenary (CW, CatW, etc)		·
Supply, delivery and installation of	of contact wire, messenger wire, dropper,	stitchwire, tensioning device
		\$86 000
Addional Wires		·
Supply, delivery and installation of	of additional wires including feeder return of	cable and electrical connectors
		\$173 000
Mechanical Equipment		·
Supply, delivery and installation of	of mechanical equipment including suppor	ts, masts, cantelever
		ФСГ 000
Electrical Equipment		\$65 000
Supply, delivery and installation of earthing switches, insulators	of electrical equipment including disconnection	ctor switches,
odraming ownorios, modiators		
		4.5.4.000
Total		\$454 000
0 0000000000000000000000000000000000000		
Source: DB AG - DB Internationa	·	
€/CAD 1,56	6 2009-06-15	
EcoTrain	By: Roger Stöcker, DBI	Continued:

Date: 2009-08-28		Page: 1 of 1
Updated Fea	sibility Study of a High Speed Ra	ail Service
in th	ne Québec City – Windsor Corrido	or
Del. 6 : Updating Construction and	Operating Costs Developmen	t of Capital Unit Cost, CAD
Technology: X E300+	Sub-System: G Power Supply	
	Sector: 4 Construction	0 (000)
F200+	Item: 1 Overhead Cat Sub-item: 1.3 OCS up to 100	enary System (OCS)
	Oub-nem. 1.5 000 up to 10.	,,
Delivery, installation and testing of		
Delivery, installation and testing of		
OCS up to 100 km/h - yards, sta	tions	
cost per km single line - independ	ent structure	
Cotorow (CIM CotiM ata)		\$108 000
Catenary (CW, CatW, etc)		·
Supply, delivery and installation of	contact wire, messenger wire, dropper,	stitchwire, tensioning device
A 1 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		\$72 000
Addional Wires		·
Supply, delivery and installation of	additional wires including feeder return of	cable and electrical connectors
		\$144 000
Mechanical Equipment		·
Supply, delivery and installation of	mechanical equipment including support	ts, masts, cantelever
		\$54 000
Electrical Equipment		·
Supply, delivery and installation of earthing switches, insulators	electrical equipment including disconnection	ctor switches,
3		
		\$270.000
Total		\$378 000
Source: DB AG - DB International	market priese	
	·	
€/CAD 1,566	2009-06-13	
EcoTrain	By: Roger Stöcker, DBI	Continued:

Date: 2009-0	8-28					Page: 1 of 1
U	-	sibility Study of		•		
	in th	e Québec City -	· Wir	ndsor Corrid	or	
Del. 6 : Updating Cons	truction and (Operating Costs	Development of Capital Unit Cost, CAD			
Technology: x	E300+	Sub-System:	G	Power Supply		
	F200+	Sector: Item:	4 2	Construction Sub station		
	F200+	Sub-item:	2	Sub station		
Delivery, installation	and testing of					
-						
Traction power station	on 25 kV AC					
		cost per unit		units		
HV Equipment		252000		5	\$1 260	000
Transformer Unit		540000		2	\$1 080	000
25kV AC Cabinet		216000		8	\$1 728	000
Auxililary Equipment	t	180000		2	\$360	000
Total					\$4 428	000
Autotus mafa was a u Ctatia					\$1 800 (000
Autotransformer Statio	OT I				\$1 000	000
Source: DB AG - DB	International	- market prices				
€/CAD	1,566	2009-06-15				
	,					
EcoTrain	n	By: Roger Stöcker,	DBI		Continu	led:
QUEBEC-WINDSON	-	, , ,	•			

Date: 2009-08-28		Page: 1 of 1
Updated Fe	easibility Study of a High Speed R	ail Service
in	the Québec City – Windsor Corrid	or
Del. 6 : Updating Construction and	d Operating Costs Developmen	nt of Capital Unit Cost, CAD
Technology: E300+	Sub-System: G Power Supply	I
	Sector: 4 Construction	
х F200 +	Item: 3 Diesel Filling	Station
	Sub-item:	
Dell' de l'adellation de la citat		
Delivery, installation and testing	Of	
Diesel Filling Station		
		ФСОО ООО
Filling construction		\$630 000
		\$0.40.000
Fuel tanks 2 x 100 000 l		\$240 000
Pipes, oil trap, construction		\$190 000
Buildings for administration and	attendant	\$250 000
Total		\$1 310 000
Source: DB AG - DB Energie Ta	nkdienste (DB Energy - Filling Services)	2009
€/CAD 1,56	66 2009-06-15	
EcoTrain	By: Otmar Wagner, DBI	Continued:
Curac-Window	,	

Date:	2009-10-21					Page: 1 o	f 2
Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor							
Del. 6 : Updating Construction and Operating Costs Development of Capital Unit Cost, C					CAD		
	Technology: X	E300+	Sub-S	System:	Н	Stations	
	<u>—</u>		;	Sector:	4	Construction/Installation	
	Х	F200+		Item:	1	Station Modifications	
			Su	b-item:	1.1 to 1.3	Gare du Palais, Centrale, Ottav	wa VIA

The Preliminary Routing Assessment and Costing Study (PRACS) reports of the QOHSRPS did not provide any estimation details for those 3 existing stations to be modified, and the lump sum costs where not obvious in the various Interim and Final Reports. The present worksheet's objective is to determine those 1995 lump sum costs and their 2009 updated modification costs.

The PRACS Final Report, Appendix, Tables 6.1 and 6.2 give the following costs of stations, in 1993 dollars,

including Professional Fees and Contingencies:

	300 km/h	200 km/h
	Composite Repr. Route	Composite Repr. Route
Windsor - Toronto	27 160 104	18 832 714
Toronto - Montreal	103 712 097	91 601 296
Montreal - Quebec	29 466 151	37 793 542
Total	160 338 352	148 227 552

The 200 km/h Composite Representative Route was composed of the same station combination as the present Updating study.

Out of the 13 stations, the individual costs for 10 of them were available from thre PRACS Reports:

	Lump Sum Costs as provided	Lump Sum Costs as provided
	by PRACS Interim Rep. No.3	by PRACS Int. Rep. No.3
	(excluding Prof. Fees)	(including Prof. Fees and
		Contingencies)
L'Ancienne-Lorette	6 500 000	8 327 391
Trois-Rivières	6 500 000	8 327 391
Laval	6 500 000	8 327 391
Dorval*	6 500 000	8 327 391
Kingston	6 500 000	8 327 391
East Toronto	6 500 000	8 327 391
Union Station (modif.)	20 000 000	25 622 740
Pearson* or Hamilton	6 500 000	8 327 391
London	6 500 000	8 327 391
Windsor	8 200 000	10 505 323
*: Excluding people movers	80 200 000	102 747 187

That leaves for the 3 "unknown" stations: 148 227 552 - 102 747 187 =

45 480 365

Table 4.3 of Interim Report no.4 of PRACS is giving the costs of the various line segments and of the sta-tions, those costs including an integration of subsystems A to H. From this table, we extracted the following:

Gare du Palais	20 952 005	24,79% Which gives:	11 273 260
Gare Centrale	36 636 302	43,34%	19 712 222
Ottawa Station	26 939 577	31,87%	14 494 883
_	84 527 884	100,00%	45 480 365



Date: 2009-10-21						Page: 2 of 2
Ţ	paated Feas	sibility Study o	та ніgn	Speed	Rail Service	
	in the	Québec City	<u>- Winds</u>	or Corri	dor	
Del. 6 : Updating Consti	ruction and Ope	erating Costs		Develo	opment of Capital L	Init Cost, CAD
Technology:	X E300+	Sub-	System:	Н	Stations	
reciniology.	<u>X</u> L300+	Sub-	Sector:	4	Construction/Install	ation
	x F200+		Item:	1	Station Modification	
		S	ub-item:	1.1 to 1.3	Gare du Palais, Cent	rale, Ottawa VIA
The results of preceeding page are including Professional Fees and Contingencies. In the PRACS, those added costs where representing an increase of 28,1137% of the base cost of each station. We thus obtain the following 1993 base costs for the 3 modified stations:						
Cara du Balaia	11 273 260)	0.70	00 440		0.000.000
Gare du Palais:	19 712 222	divided by		9 418	say:	8 800 000
Gare Centrale: Ottawa Station:	14 494 883	1,281137 :		86 506		15 400 000
Ottawa Station:	14 494 003)	113	14 077		11 300 000
The preceeding wo	PRACS, \$ ₁₉₉₃	EcoTrain, \$ ₂₀₀₉		following r	results	
L'Ancienne-Lorette	6 500 000	11 000 000				
Trois-Rivières	6 500 000 6 500 000	11 000 000 11 000 000				
Laval Dorval	6 500 000	11 000 000				
Kingston	6 500 000	11 000 000				
East Toronto	6 500 000	11 000 000				
Union Station	20 000 000	33 000 000				
Pearson	6 500 000	11 000 000				
London	6 500 000	11 000 000				
Windsor	8 200 000	14 000 000				
	80 200 000	135 000 000		mean in	flation factor: 1,68	32918
-			=			
Thus				FcoT	rain, \$ ₂₀₀₉	
Gare du Palais:	8 800 000	14 812 968	say:		15 000 000 \$	
Gare Centrale:	15 400 000	25 922 693	ouy.		26 000 000 \$	
Ottawa Station:					·	
ECOT	rain	By: JC. Therri	en, ing., D	essau	Continued:	

Date: 2009-10-21					Page: 2 of 2
U	pdated Feasik	ility Study of a	High Speed	Rail Service	
	•	Québec City – \	• .		
Del. 6 : Updating Constr	uction and Oper	ating Costs	Develo	opment of Cap	ital Unit Cost, CAD
Technology:	X E300+	Sub-Syst	em: H	Stations	
		_	ctor: 4	Construction/	Installation
	x F200+	l II	em: 1	Station Modif	ications
		Sub-it	tem: 1.1 to 1.3	Gare du Palais	, Centrale, Ottawa VIA
added costs who	The results of preceeding page are including Professional Fees and Contingencies. In the PRACS, those added costs where representing an increase of 28,1137% of the base cost of each station. We thus obtain the following 1993 base costs for the 3 modified stations:				
Gare du Palais: Gare Centrale: Ottawa Station:	11 273 260 19 712 222 14 494 883	divided by 1,281137:	8 799 418 15 386 506 11 314 077	say:	8 800 000 15 400 000 11 300 000
The preceeding	worksheets for th	ne 10 other station	s gave the follov	ving results	
	PRACS, \$ ₁₉₉₃	EcoTrain, \$ ₂₀₀₉			
L'Ancienne-Lorette	6 500 000	11 000 000	-		
Trois-Rivières	6 500 000	11 000 000			
Laval Dorval	6 500 000 6 500 000	11 000 000 11 000 000			
Kingston	6 500 000	11 000 000			
East Toronto	6 500 000	11 000 000			
Union Station	20 000 000	33 000 000			
Pearson	6 500 000	11 000 000			
London	6 500 000	11 000 000			
Windsor_	8 200 000 80 200 000	14 000 000 135 000 000 -	_ ——► mean int	flation factor:	1,6832918
=	80 200 000	133 000 000	=		1,0032910
Thus:			EcoT	rain, \$ ₂₀₀₉	_
Gare du Palais:	8 800 000	14 812 968	say	15 000 000 \$	
Gare Centrale: Ottawa Station:	15 400 000 11 300 000	25 922 693 19 021 197		26 000 000 \$ 19 000 000 \$	
Ottawa Station:	11 300 000	19 021 197		19 000 000 \$	
ECOT	rain	By: JC. Therrie	n, ing., Dessau	Continued:	

Date:				Page:	of	
	QUI	EBEC-ONTARIO HIGH UNIT COSTS FOR PRI		ROJECT		e and a second and
Technology:		300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sub-system: Sector: Item:		TIONS R. INSTALLATION	
Geographical '	Variatio	n ? \square no \square yes If yes, ind	licate segments applica	ıble:		
C) MOD	DIFICAT	IONS AT UNION STATION				-
i)	Reco	onstruction of platform acces	s tunnel and vertical cir	rculation to p	olatforms	
	Area	of tunnel to be reconstructe	$d = 2000m^2$	/-/-···		
	Tota	I cost including new finishes	$= 2000 \times \frac{1250}{52,50}$	00 =	\$ 2,500,000	\$5,000,000
	Assu	ıme 5 new elevators at \$100	,,000 each \$300,000	ea. =	\$ 500,000	\$1,500,000
	Assu	ıme 5 x 2 new escalators at		000 ea.	<u>\$2,250,000</u>	\$5,000,000
		Total access modification		=	\$5,250,000	_
		Allowance for O/I Total access modification	I and profit (15%)	=	<u>\$ 750,000</u> \$6,000,000	\$10,500,000
ii)	Upgi	rading and alternations to Ma	in Concourse area	allow	\$5,000,000	-
iii)	Mod	ification and upgrading of tra	in services area	allow	\$ 2,000,000	\$4,000,000
iv)	Expa	ansion of parking structure 1	00 bays at \$1 0,000 \$2	25,000	\$1,000,000	\$2,500,000
v)	Mod	ification to five HSR platform	ns 5 x 1,200,000 \$2,0	000,000	\$ 6,000,000	\$10,000,000
	Tota	l order-of-magnitude cost			\$20,000,000 \$33,000,000	
1			Name and a supplemental and a su			
Prepared by:				co	ntinued \Box	

Date:						Page: <u>l</u> of <u>5</u>
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING						
Technology		300 + kph - ne 300 + kph - ex 200 + kph - ex	ist. R/W	Sec	tor: 4	- STATIONS - CONSTR/INSTALLATION - 2.1
Geographic	al Variatio	n?□no□y	es If yes, inc	dicate segments ap	plicable	:
		ONS AT INTERM	<u></u>		<u>· ·</u>	
			· · · · · · · · · · · · · · · · · · ·			
i) St	ations in t	his category:		••••••••••••••••••••••••••••••••		
a)	London	one was a state of the state of				
b)	Kitchene	r - Waterloo	(new ROV	V only)		
c)	Hamilton	- Burlington	(ex ROW	only)		
d)	Pickering	- Whitby	(ex ROW	only)		
e)	Hwy 407	7/Markham E.	(new ROV	V only)		
f)	Kingston			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
g)	Ottawa -	Merivale				
h)	Laval	***************************************				
i)	Trois - Ri	viere				
j)	Ancienne	- Lorette				
ii) Pr	imary com	ponents:				
a)	Property					
b)	Station B	lldg.				
c)	Access F	Roads				
d)	Grading (& Drainage	nomeno aldenti Sente apparato apparato e			
e)	Parking A	Area/Bus Bays/K	iss & Ride			
f)	f) Platforms and canopies					
g)	g) Vertical circulation (Escalators/elevators)					
h)	Pedestria	n Tunnels	1,5,10			
i)	Fencing		*************************************			

andala di		ntdodus, spacements muse communication				
		۵				
Prepared by	y:					continued 🗹

Date:		Mayor yellow white		Page: <u>2</u> of <u>5</u>
uchi Trining and a second a second and a second a second and a second a second and a second and a second and a second and	QUI	BEC-ONTARIO HIGH		ROJECT
Technol	ogy:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W		H - STATIONS 4 - CONSTR/INSTALLATION 1 - 2.1
Geograp	hical Variation	n? \square no \square yes If yes, inc	licate segments applica	ble:
iii)	Developmen	t of unit costs for Line Statio	ns	
	Item	er en		Est. Cost
	a) Property		,,,	
		umed: 200 metres x 100 me		
	Land cos	ts are included in sub-system	1 A	-
	b) Station B	lda.		
		r concourse containing:		
	• Ticke			
.,	• Wait	ing Areas		
	• Was	hrooms		
	• Serv	ice Rooms		
	• Cond	cessions		
	• Circu	llation		
	***************************************	,		·····
	Area ass	umed for above elements =	1,000m²	
	Based on	GO Transit stat. costs, allow		\$ 2,600,000
		The state of the s	\$3,500/sq.m.	\$3,500,000
	c) Access F	······································		
	Allow 20	0 m of 2 lane road to access		
,		Cost at \$400		\$ 80,000
	d\ Drainago	<u>[\$200</u>	<u>///////</u>	Ψτου,ουσ
	d) Drainage	wance for storm sewers, sub	-drains surface ditches	2
		holes, catchbasins.		\$4 00,00 0
.,				\$600,000
		Congression Constitution (1997) Constitution Constitution (1997)		
Prepared	d by:			continued 🗹

Date:	Page:	3 of 5	
	QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING		
Technology:	☐ 300 + kph - new R/W Sub-system: H - 57, ☐ 300 + kph - exist. R/W Sector: 4 - CONS; ☐ 200 + kph - exist. R/W Item: ± 1 - 2.1	TIONS TR./INSTALLATION	00000000000000000000000000000000000000
Geographical	Variation ? 🔲 no 🔲 yes If yes, indicate segments applicable:		
	Assume general site and station track grading earthworks		
	averaging 1 metre over area required.		
	i.e. $(200 \times 100) + (1,000 \times 2 \times 8) = 20,000 + 16,000 @ $5/m^3$	\$180,000	
	\$10/cu.n	1. \$360,000	
e) F	arking/Bus pays		
•	Assume 250 spaces at \$1,600 ea. \$2,800 ea.	\$400,000	\$700,000
•	Assume 6-bay bus terminal/loop	\$100,000	\$200,000
•	Kiss & Ride area (Approx. 30 spaces) + circ.lanes	\$ 70,000	\$150,000
Ā	as per CIGGT Fax 13/4/93:		
2	single sided platforms required: - 400 m long (+300)		
	- 300 m long (200 - 250)	4000 000	(*COO OOO)
	00 m platforms : 2 @ \$160,000 \$300,000	\$320,000	\$600,000
(anopies/Shelters : Allowance	\$ 200,000	\$275,000
g) \	retical Circulation \$500,000		
E	scalators : 2 at \$350,000 (mechanical and structures)	\$700,000	\$1,000,000
E	levators : 2 at \$150,000 (mechanical and structures) \$300,000	\$ 300,000	\$600,000
h) F	edestrian Tunnels		
5	tructure and finishes to provide access from concourse		
t	o platforms (under or over 4 tracks)	\$ 600,000	\$1,200,000
Prepared by:	co	ontinued 🗹	

Date:			Page: <u>4</u> of <u>5</u>			
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING						
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sub-system: Sector: Item:	H - <u>STATIONS</u> 4 - <u>CONSTR/INSTALLATION</u> LA - 2.1.			
Geographical Variation	n? 🗆 no 🗖 yes If yes, ind	icate segments applica	ble:			
i) Fencing		-				
Assume 8	500 m @ \$ 20 /m \$80/m		\$40.000 \$10,000			
j) Miscellan	eous items (allow 10%)		\$962,500 <u>540,000</u>			
TOTAL S	TATION COST (All compone	nts)	\$6,500,000			
			\$10,587,500			
			use \$11,000,000			
The second secon			to promote the second s			
			-			
Prepared by:			continued 🗹			

Date:		and Market	Page: <u>5</u> of <u>5</u>
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT UNIT COSTS FOR PRELIMINARY ROUTING			
Technology:	300 + kph - new R/W 300 + kph - exist. R/W 200 + kph - exist. R/W	Sub-system: Sector: Item:	
Geographical Variation ? no yes If yes, indicate segments applicable:			
B) TERMINAL STATION AT WINDSOR			
i) Primary components assumed to be as for Line Stations with additions as follows:			
a) 2 side platforms replaced by 3 island platforms between 4 tracks i.e. equivalent to 4			
side platforms.			
b) Vert. Circulation:			
Escalators - 2 for 3rd platform			
Elevators - 1 for 3rd platform			
c) Pedestrian Tunnels:			
Additional stair/escalator structure for 3rd platform length as for Line Stations.			
d) Station Bldg:			
Assume 20% increase in Bldg. area.			
ii) Summary o	of Unit Cost Components		
a) Line sta	tion total cost	\$9	9,800,000 \$ 6,500,000
b) Addition	n for platforms		\$600,000 \$ 320,000
c) Allowar	ce for additional canopies/she	elters	\$200,000 \$ 120,000
d) Vert. Ci	rc.	\$1	,300,000 \$ 850,000
e) Pedestr	ian Tunnels		\$33,000 \$ 20,000
f) Add for	larger station bldg.	,	\$600,000 \$ 260,000
g) Addition	nal misc. items	\$1	<u>,253,300</u> \$ 130,000
TOTAL ST	ATION COST (All components		.800,000 \$ 8,200,000 1,000,000
Prepared by:			continued \Box

Dat	e:	2009-08-05					Page: 1 of 1			
		Updated Fea	sibility Study o	f a H	igh Speed Ra	ail Service				
		in th	e Québec City	– Wir	ndsor Corrido	or				
De	el. 6 : Updating	g Construction and	Operating Costs		Developmen	t of Capital Unit (Cost, CAD			
	Technology:	x E300+	Sub-System:	ı	Signals / Teled	com				
		_	Sector:	4	Construction	.1				
	<u> </u>	× F200+	Item: Sub-item:	1 1.1	Interlocking Sy	ystem Existing Stations				
			Sub-item.	1.1	πααριατίοπτο	Existing Otations				
	Modification	n and adaptation wit	h delivery inetall	ation	and testing of					
	Modification	r and adaptation wit	in delivery, install	alion	and testing or					
Α	Exicting Ind	loor Installations								
	-									
	Local panels or workstation Control-units or relay groups (incl. frames, indoor cabling, interfaces etc.) for:									
	Control-unit	, , , ,	•		ning, interrace	s etc.) for:				
		•	d shunting signal	S						
		switchmachine of								
		Track vacancy is	nstallations							
	Power supp	oly signalling								
В	Outdoor Ins	stallations								
	Light signal	s with all componer	nts for							
		Main signals								
		Shunting signals	5							
	Switchcontr	ol (incl. switchmach	nines, rodding set	s and	d detectors)					
	Track vacai	ncy installations								
	Cabling (de	livery, burying, insta	allation, testing e	c.)						
		Main cables								
		Branch cables								
		Cable accesorie	es							
	Total costs	for one existing star	tion (estimation)				8 000 000 \$			
	Note: Exact costs can be calculated after the assessment of the existing									
		signaling technolog	•	d cor	inection desigi	n of the				
	individual stations only.									
	S FCC	Train	By: Wolfgang Krie	ner. D	DBI	Continued:				
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Dat	e: 2009-	08-05					Page: 1 of 1			
		Updated Fea	sibility Study o	f a H	igh Speed Ra	ail Service				
		in th	e Québec City	– Wir	dsor Corrido	or				
De	el. 6 : Updating Con	struction and	Operating Costs		Developmen	t of Capital Unit C	Cost, CAD			
	Technology: x	E300+	Sub-System:	I	Signals / Teled	com				
	_		Sector:	4	Construction					
	Х	F200+	Item: Sub-item:	1 1.2	Interlocking Sy Intermediate S					
			Sub-iteiii.	1.2	intermediate c	Diations				
	Delivery, installat	tion and testing	n of :							
Α	Indoor Installation		g 0							
, ,	Local workstation									
	CBI (Computer based interlocking) basic hard- and software									
	CBI (Computer based interlocking) basic nard- and software Control-units (hard- and software) incl. frames, indoor cabling, interfaces etc. for:									
	Signals as main signals and shunting signals (fictive)									
	Switchmachine control-unit									
	Track vacancy installations									
	Power supply signalling									
	Service and diagnostic system									
	Costs for indoor installations 3 600 000 \$									
		motanationo				l	σ σσσ σσσ ψ			
В	Outdoor Installati	ion <u>s</u>								
	Main signal (fictiv		l board							
	Shunting signal (,								
	Switchcontrol (inc	•	_	s and	detectors)					
	Track vacancy in	stallations bas	sed on axle count	ing sy	/stems					
	Cabling (delivery	, burying, insta	allation, testing et	.c.)						
		cables		,						
	Brand	ch cables								
	Cable	e accesories								
	Building construc	ction civil work	S							
	Costs for outdoor					[\$2 400 000			
						L	·			
	Total costs for or	ne intermediat	e station			[\$6 000 000			
	EcoTrai	in	By: Wolfgang Krie	ner. D	BI	Continued:				
Pur	BEC. WINDSON		,	, -		22				

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		Updated Fea	sibility Study o	f a Hi	igh Speed Ra	ail Service				
		in th	e Québec City -	- Wir	dsor Corrid	or				
De	I. 6 : Updating Con	struction and	Operating Costs		Developmen	t of Capital Unit	Cost, CAD			
-	Гесhnology: х	E300+	Sub-System:	I	Signals / Teled	com				
		5000	Sector:	4	Construction	votom				
	Х	F200+	Item: Sub-item:	1 1.3	Interlocking Sy Cross Overs	ystem				
			045 (10)	1.0						
	Delivery, installat	ion and testing	a of :							
	<u>=,,</u>		g							
Α	Indoor Installation	ns								
	CBI (Computer b		ing) basic hard- a	and so	oftware					
	Control-units (hard- and software) incl. frames, indoor cabling, interfaces etc. for:									
	Main signals									
	Switchmachine control-unit									
	Track vacancy installations									
	Power supply signalling									
	Service and diag	ū								
	Corvido aria alagi									
	Costs for indoor i	installations					\$1 900 000			
В	Outdoor Installati	ions								
	Mainsignal (fictive		lboard							
	Switchcontrol cor	,		odding	sets and det	ectors)				
	Track vacancy in					,				
	Cabling (delivery			_	•					
	- , , , ,	cables	, 0	,						
	Brand	ch cables								
	Cable	e accesories								
	Building prefabrio	cated								
	0.1									
	Costs for outdoor	r installations					\$900 000			
	Total costs for one cross over 2 800 000 \$									
	EcoTrai	in	By: Wolfgang Krie	ner, D	Bl	Continued	: 🗆			
QUE	EC-WINDSON LUIC		, 2119-2119	,		227234				

Da	te: 2009-	-08-05					Page: 1 of 1			
		Updated Fea	sibility Study o	f a H	igh Speed Ra	ail Service				
		in th	e Québec City	– Wir	ndsor Corrido	or				
De	el. 6 : Updating Con	struction and	Operating Costs		Developmen	t of Capital Unit (Cost, CAD			
	Technology: x	E300+	Sub-System:	ı	Signals / Teled	com				
			Sector:	4	Construction					
	Х	F200+	Item:	1	Interlocking Sy					
			Sub-item:	1.4	Fictive Block I	nstaliations				
	Delivery, installat	tion and testing	g of :							
	•									
Α	Indoor Installation	<u>ns</u>								
	CBI (Computer based interlocking) basic hard- and software									
	Control-units (ha	rd- and softwa	ıre) incl. frames, i	ndoo	r cabling, inter	faces etc. for:				
	Block signals (fictive)									
	Track vacancy installations									
	Power supply signalling									
	Service and diagnostic system									
	9,									
	Costs for indoor	installations					325 000 \$			
В	Outdoor Installat	<u>ions</u>								
	Light signal with	all component	s for block signal	s (fict	ive) incl. signa	ıl board				
	Track vacancy in	stallations bas	sed on axle count	ing sy	/stems					
	Cabling (delivery	, burying, insta	allation, testing et	c.)						
	Main	cables								
	Brand	ch cables								
	Cable	e accesories								
	Building prefabrio	cated								
	Costs for outdoo	r installations					325 000 \$			
	Total costs one fictive block installation 650 000									
Ć	EcoTra	in	By: Wolfgang Krie	ner, D	BI	Continued:				
90,	ARC. WINDSON			•						

Dat	e: 2009-	08-05					Page: 1 of 1
		Updated Fea	sibility Study of	аН	igh Speed Ra	ail Service	
		in th	e Québec City -	· Wir	ndsor Corrido	or	
De	el. 6 : Updating Cons	struction and (Operating Costs		Developmen	t of Capital Uni	t Cost, CAD
	Technology: x	E300+	Sub-System:	I	Signals / Teled	com	
	_		Sector:	4	Construction		
	Х	F200+	Item: Sub-item:	2 2.1	Automatic Tra Total Installation		
			Sub-item.	2.1	Total Installation	0113 E100	
	Delivery, installat	ion and testing	r of :				
	<u>Delivery, Iristaliat</u>	ion and testing	<u> </u>				
Α	Radio Block Cent	tre Installation	S				
	Basic hard- and s		_				
	Interface to the G	SM-R system					
	Service and diag						
	Power supply	•					
В	Installations at St	ations and Ou	<u>itdoor</u>				
	Interfaces to the	interlocking in	stallations				
	Balises as passiv	e positioning l	oeacons				
	•						
	Average total cos	sts ETCS per l	km double track li	ne			220 000 \$
					-		
201	EcoTrai	in	By: Wolfgang Krier	er, D	BI	Continue	d:

Dat	te: 2009	9-08-05					Page:	1 of 1	
		Updated Fea	sibility Study of a	Hiç	gh Speed Ra	ail Service			
		in th	ie Québec City – V	Vind	dsor Corrido	or			
De	el. 6 : Updating Co	nstruction and	Operating Costs		Developmen	t of Capital Uni	t Cost, C	AD	
	Technology: x	E300+	Sub-System:	1	Signals / Teled	com			
	_			-	Construction				
	Х	F200+			Automatic Tra Total Installati				
			Sub-item: 2	.2	TOTAL ITISTALIALI	UIIS GOWI-N			
	Delivery, installa	ation and testing	n of :						
	Delivery, mistana	ation and testing	g or .						
Α	GSM-R Installat	ions (centralise	ed and line depende	nt)					
	Basic hard- and software including								
	Mobile switching centre								
	Base station controller								
	Mult	iplexer dropout	S						
	Mas	t & antenna kit							
	Han	dheld							
	Base	e transceiver st	ation						
	Cab	ling							
	Inte	rface to the ET	CS system						
	Serv	vice and diagno	stic system						
	Pow	er supply telec	ommunications						
В	Optical Fibre Ca	ables (OFC) alo	ong the line including	1					
	Cab	le laying, trenc	hing and splicing						
	Poly	ethylen pipes							
	Average total co	sts GSM-R pe	r km double track lin	ie				140 000 \$	
<u> </u>		_		_		_		_	
20,	ECOTra	in	By: Wolfgang Kriener	, DB	31	Continue	d: [

Date: 200	09-08-05					Page: 1 of 1		
	Updated Fea	sibility Study o	f a H	igh Speed Ra	ail Service			
	in th	ne Québec City	– Wir	dsor Corrido	or			
Del. 6 : Updating C	onstruction and	Operating Costs		Developmen	t of Capital Unit	Cost, CAD		
Technology: x	E300+	Sub-System:	I	Signals / Teled	com			
_	•	Sector:	4	Construction				
Х	F200+	Item: Sub-item:	3 3.1	Operation Con	trol Center asic Installations			
		Sub-item.	0.1	Danamy and D	adio indianationo			
Dolivory instal	lation and toatin	a of						
<u>Delivery, iristal</u>	lation and testin	<u>g or.</u>						
Daois bard on	d ooftware incl	indoor oabling ou	at a m					
Basic hard- and software incl. indoor cabling system								
Basic workstations Regio plotter, printers and peripherical equipment								
Basic plotter, printers and peripherical equipment								
Basic panorama projection of the entire line incl. hard- and software Basic system of service and diagnostic of interlocking incl. hardware and software								
-		_	ocking	inci. nardwar	e and software			
	llations for data t	transmission						
Power supply (
Civil works for	the OCC buildin	g						
Total costs for	the basic install	ations of the OCC)			6 300 000 \$		
EcoTr	ain	By: Wolfgang Krie	ner, D	BI	Continued:			

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l	Jpdated Fea	sibility Study o	f a H	igh Speed Ra	ail Service				
	in th	e Québec City -	- Wir	dsor Corrido	or				
Del. 6 : Updating Cons	struction and	Operating Costs	Development of Capital Unit Cost, CAD						
Technology: X	E300+	Sub-System:	I	Signals / Teled	com				
		Sector:	4	Construction	1				
Х	F200+	Item: Sub-item:	3 3.2	Operation Cor Technical Insta	itroi Center allations (Length d	ependent)			
Delivery, installation and testing of : Hard- and software incl. indoor cabling system Hard- and software of all remote controlled stations in relation to the installations on the line Workstations for operators incl. hardware such as monitors, keyboard etc. Plotter, printers and peripherical equipment									
Plotter, printers and peripherical equipment Supplements of the panorama projection of the entire line incl. hard- and software Average total costs OCC per km double track line 9 400 \$									
EcoTrail	n	By: Wolfgang Krie	ner, D	ВІ	Continued:				

Date: 2	009-08-05					Page: 1 of 1			
	Updated Fea	sibility Study of a	Hi	gh Speed Ra	il Service				
	in th	e Québec City – V	N in	dsor Corrido	or				
Del. 6 : Updating	Construction and (Operating Costs		Developmen	t of Capital Unit (Cost, CAD			
Technology: x	E300+	Sub-System:		Signals / Telec	com				
_		3331311	4	Construction	ation lantallations				
х	F200+	Item: Sub-item:	4	relecommunic	ation Installations				
Delivery, inst	allation and testing	g of :							
General Com	munication Install	<u>ations</u>							
Basic hard- a	and software includ	ding							
Д	daptation to the G	SM-R systems							
Р	assenger informa	tion systems							
Т	Telephone installations								
Cabling									
S	Service and diagno	stic system							
P	ower supply telec	ommunications							
Average tota	l costs telecommu	nication per km dou	ıble	track line		47 000 \$			
			_		_				
ECOT	rain	By: Wolfgang Kriene	r, Di	31	Continued:	Ш			

Date: 2009-08-0	ე5					Page: 1 of 1			
Up		sibility Study o		•					
	in th	e Québec City -	– Wir	ndsor Corrido	or				
Del. 6 : Updating Constru	iction and (Operating Costs		Developmen	t of Capital Unit (Cost, CAD			
Technology: x	E300+	Sub-System:	I	Signals / Teled	com				
	- 000.	Sector:	4 5	Construction	2 Train Equipmen	•			
х	F200+	Item: Sub-item:	5	EU I MO FEARI	Z Hallı Eyulpıllen	l			
Delivery, installation	and testing								
Equipment of conve	<u>ntional trair</u>	ns with ERTMS L	evel 2	2					
ETCS Level 2 a GSI	ETCS Level 2 a GSM-R - On board unit								
Cost for locomotives	with two s	tands				450 000 \$			
EcoTrain		By: Wolfgang Krie	ner, D	BI	Continued:				

Date:	2009-0	08-10	T						Page: 1 of 4		
	-	Updated Fea	•	/ Study of bec City -		•	-				
Del.	6 : Updating Cons	struction and	Operatir	ng Costs		Dev	elopment c	of Capital U	nit Cost, CAD		
Technology: X E300+ Sub-System: Sector: F200+ Item:				4 Construction							
l			,	Sub-item:	1.1	E300)+ Trainset				
f	The following cha for high speed tra significant differe	ains are usual	ally compa	pared by couted and co	ost per concer	er seat ntrated	t. There are d propulsio	e no on systems			
l	Train	Year C	Company	Cost per train Mio €		ner of eats	Cost per train Mio CAD	Cost per Seat T CAD	Source		
Α	AGV	2008 N	ITV (Italiy)	26.0		500	40.7	81	Wikipedia		
В	Talgo 350	1 2005 1	RENFE (Spain)	21.8		361	34.1	95	http/www.hochgeschwi ndigkeitszüge.com		
С	Velaro E	2001	RENFE (Spain)	25.2		404	39.5	98	DB AG		

33.3

52.2

480

DB AG

109

Exchange rate € - CAD

Velaro D (ICE 407)

D

1.566 (15.06.2009)

DB AG

(Germany)

These prices do not include

- the adaption for FRA requirements
- the adaption of the profile
- major changings of train length (standard: 200m)

2008

EcoTrain	By: Eberhard Kieffer, DBI	Continued:	·

Date: 2009-	-08-10				F	Page: 2 of 4
	-	sibility Study o		•		
		e Québec City -	- Wir			
Del. 6 : Updating Con	struction and (Operating Costs		Developmen	t of Capital Unit Co	est, CAD
Tachnology	E200 .	Sub System		Rolling Stock		
Technology: x	E300+	Sub-System: Sector:	J 4	Construction		
П	F200+	Item:	1	Capital Unit Co	ost	
	. 2001	Sub-item:	1.1	E300+ Trainse		
Average price pe	er train seat (in	thousand CAD)				
81*	95	98		109	100	
[ft]	[Es]]	[Ger	n D Avera	ig e
EcoTra	in	By: Eberhard Kieff	er, DE	ВІ	Continued:	,

e:	2009-08	3-10							Page: 3 o	f 4
	Ul		bility Study o	_	-		ervic	9		
		in the	Québec City -	- Wind	Isor Co	rridor				
el. 6 : Upd	ating Const	ruction and Op	erating Costs		Develop	ment of	Capita	Unit C	ost, CAD	
				_	D III O					
Technolo	gy: x	E300+	Sub-System:		Rolling St Construct					
		F000 -	Sector:	•						
		F200+	Item: Sub-item:		Capital U E300+ Tr					
			Sub-itein:	1.1	_000+ 11	umout				
Prices N	Vorth Ame	rica			Prices	Europe	e			
Prices N	North Amer		= 21%		Prices	Europe)			5
	Д]	Difference	≔ 21%		Prices	Europe	-			
	North Amer		≔ 21%	8	Prices	Europe 407		43	254	>
	Д]	Difference		8	Prices			43 	364	`
	Д]	Difference		8	Prices			4 3	364	
	Д]	Difference		8	Prices			4 3	364	
	Д]	Difference		8	Prices			4 3	364	
611	483	Difference 84	399			407				50
611 Trice Acela (Д]	Difference 84 (20 Extraprice oco) FRA 21%	399 price of a similar order in	8 inflation	n 2% p	407	Extra n Loco.	price 15 Germany	20 HST 25	an
611	483 20 Price Acela co) HST+15Lo	Difference 84 (20 Extraprice oco) FRA 21%	399		n 2% p	407	Extra n Loco.	price 15	20 HST 25	an
611 rice Acela (IST+15 Loc	483 20 Price Acela co) HST+15Lo	Difference 84 (20 Extraprice oco) FRA 21%	price of a similar order in Europe 1906		n 2% p	407 rice of a lar order is rope 1997	Extra n Loco.	price 15 Germany	20 HST 25	an
fice Acela (IST+15 Loc mio US\$	483 483 20 Price Acela co) HST+15 Lo mio € 199	Difference 84 (20 Extraprice 900) FRA 21%	price of a similar order in Europe 1906	inflatio	n 2% p simi Eu	do7 rice of a lar order is rope 1997 mio €	Extra 1 Loco, (E10	price 15 Germany 1 1997)	20 HST 25	an

By: Eberhard Kieffer, DBI

Continued:

EcoTrain

Date: 2009-	08-10				Page: 4 of 4
	•	sibility Study o	• .		ce
		e Québec City -			
Del. 6 : Updating Con	struction and (Operating Costs	Developm	ent of Capi	tal Unit Cost, CAD
l <u>.</u>			Dall'as Olas		
Technology: x	E300+	Sub-System:	J Rolling Stoc		
	5000	Sector:	4 Construction		
	F200+	Item: Sub-item:	 Capital Unit E300+ Trair 		
		Sub-item:	1.1 L300+ 11an	1561	
Total construction American condition	•	sands CAD) per s	seat including ada	aption to N	orth 120
95	98	109	100 -		
System B	System (C System D	Average A	Adition	al Estimated
[Es]	[Es]	[Ger]		Costs	
				(20%)	
Total cost for one	e train with 400) seats:			\$48 000 000
EcoTrai	in	By: Eberhard Kieff	er. DBI	Co	ontinued:
OURACC. WINDUST ECOITA			, -		

Date	: 2009-	-08-10						Pa	ge: 1 of 3
		Updated Fe	_	-			Service		
					Windsor				
	. 6 : Updating Con		1			<u> </u>	of Capital U	nit Cos	t, CAD
T	echnology:	E300+	Sub	Sub-System: J Rolling Stock Sector: 4 Construction					
	Х	F200+		Item:	1 Capit	al Unit Cos			
			9	Sub-item:	1.2 F200	+ Diesel Tra	ainset		
The following chart provides published rolling stock prices of actual projects. Prices for high speed trains are usually compared by cost per seat.									
	Train	Year	Company	Cost per train Mio €	Numer of Seats	Cost per train Mio CAD	Cost per Seat T CAD	Source	
А	Agila Super Express diesel (10 trailors)	2008 Tr	Dpt. of ansport UK	35.7	581	55.9	96	DB AG	
	Exchange rate € - CAD	1.566 (1	5.06.2009)						<u>.</u>
	These prices do - the adaption for - the adaption of - major changing	r FRA require the profile		dard: 200n	n)				
000	EcoTra	in	By: Ebe	rhard Kieffe	er, DBI		Continu	ued:	,

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	Up		sibility Study o		• •		ervice		
		in th	e Québec City	– Win	dsor Corrid	dor			
Del. 6 : Updat	ing Constru	uction and (Operating Costs		Developme	nt of C	apital Unit C	cost, CAD	
Technology	/ :	E300+	Sub-System:	J	Rolling Stock				
			Sector:	4	Construction				
	Х	F200+	Item:	1	Capital Unit				
			Sub-item:	1.2	F200+ Diese	l Trains	set		
Estimation of additional cost for adjusting rolling stock for the North American market:									
Prices No	rth Ameri	ca			Prices Eu	ırope			
611		Difference	24%						
			2170						
	483	84	399		3 4	07	43		
Price Acela (20 HST+15 Loco) mio US\$		co) FRA 21	_	inflati		order in e 1997	Extra price 15 Loco, German (E101 1997)	20 HST 250 ykmih. German (ICE 2 1997)*	Υy
The price of FRA compatible train sets will be about 20% higher then comparable trains in Europe.									
Source N	lorth Ameri	ca: Internat	ional Railway Jo	urnal (Okt 1999				
OLIFORD EC	oTrain	ĺ	By: Eberhard Kieff	fer, DB	I		Continued:		

Date: 2009	9-08-10					Page: 3 of 3
	Updated Fea	sibility Study o	f a H	igh Speed Ra	ail Service	
	in th	e Québec City -	- Wir	ndsor Corrido	or	
Del. 6 : Updating Co	nstruction and	Operating Costs		Developmen	t of Capital Unit	Cost, CAD
Technology:	E300+	Sub-System:	J	Rolling Stock		
		Sector:	4	Construction		
х	F200+	Item:	1	Capital Unit C	ost	
		Sub-item:	1.2	F200+ Diesel	Trainset	
Total constructi American condi	,	sands CAD) per s 19.3	seat ii	ncluding adap	tion to North	
		13.3		115.0		
	96.3					
Syste	em A [UK]	Aditional Costs (20 %)		Estimated otal Cost		
Total cost for or	ne train with 400) seats:				\$46 240 000
ECOTTA	ain	By: Eberhard Kieff	er, DE	BI	Continued	: 📙

	09-15						Page: 1 o
	Updated F	easibility	Study of	a High Spe	ed Rail S	Service	
	ir	n the Québ	ec City -	Windsor C	orridor		
. 6 : Updating Con	struction a	nd Operatin	g Costs	Develo	opment of	Capital Uni	it Cost, CAD
echnology:	E300+	Sub-	System:	J Rolling	Stock		
_			Sector:	4 Constru			
Х	F200+		Item:	•	Unit Cost		
		S	ub-item:	1.1 F200+	Hybrid Trair	nset	
ventilation. Thus That means that technically feasib AMT Montreal an The costs for hyb locomotives. Based on the est dsitribution of cost trainset is as follows.	hybrid train ble (see the nd NJT Nev orid locomo imate for th sts for pow	nsets (diese recent orde v Jersey). tives is abo	el and electers of hybrout the dou	ric powered id locomotive ble of comp) are requives Diesel arable diesend	ired. This i / 25 kV by sel med	is .
trainset is as follows:							
		Diesel t	rainset	Hybrid to	rainset		
ltem	Number		rainset Total cost	•			
Item Power cars	Number 2			•			
		Unit cost	Total cost	Unit cost	Total cost		
Power cars	2	Unit cost	Total cost 20 M\$	Unit cost	Total cost 40 M\$		

EcoTrain	By: Hans Frank Förster, DBI	Continued:
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Date:	2010-0	6-30				Page: 1 of 2			
Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor									
Del. 6 : U	Jpdating Cons		d Operating Costs						
Techno	ology:	E300+	Sub-System:	K	Maintenance f	acilities			
			Sector:	4	Construction				
	х	F200+	Item:	1	Maintenance \	/ehicles Power Supply			
			Sub-item:		none				

Number of maintenance vehicles per maintenance base

Maintenance Base [km]	Catenary Measuring Car (CMC)	OCS Installation Car (OIC)	Drum Car (DC)	Multi- purpose vehicles (Road-Rail)	OCS Maintenance Car (MC)	Diesel Locomotive	Road Vehicles
1222.237							
1207.557							1
1149.657							1
1091.757							1
1029.807							1
967.857							1
929.843							1
830.715							1
764.629							1
673.917							1
613.442							1
555.256							1
497.069							1
409.790							1
359.278							1
303.645							1
243.430							1
183.215							1
97.447							1
11.679							1
Total							19



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	Updated Fe	asibility Study o	f a Hi	gh Speed Ra	il Service		
	in t	he Québec City -	- Win	dsor Corrido	r		
Del. 6 : Updating Cons	struction and	Operating Costs		Development	t of Capital Unit (Cost, CAD	
Technology:	E300+	Sub-System:	K Maintenance facilities				
		Sector:	4	Construction			
Х	F200+	Item: Sub-item:	1	none	ehicles Power Su	ppiy	
		Cab item					
Iter	m		No	Unit price [\$]	Total		
Ca	itenary Measur	ring Car (CMC)		7 500 000			
	CS Installation			2 500 000			
	um Car (DC)			800 000			
Mu	ılti-purpose vel	hicles (Road-Rail)		800 000			
oc	CS Maintenand	e Car (MC)		1 500 000			
Die	esel Locomotiv	re		4 000 000			
Ro	ad Vehicles		19	80 000	1 520 000		
To	tal		79		1 520 000		
То	otal costs for	· maintenance ve	hicles			\$ 1 520 000	
						Ψ 1 320 000	
EcoTrain By: Ottmar Grein, E					Continued:		

Date:	2010-06-30)				Page: 1 of 2			
	Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor								
				- vvi					
Del. 6 : Up	dating Construc	tion and	Operating Costs	Development of Capital Unit Cost, CAD					
Techno	logy: x E3	300+	Sub-System:	K	Maintenance f	acilities			
	_		Sector:	4	Construction				
	x F2	200+	Item:	2	Maintenance \	Vehicles Signalling/Telecom			
			Sub-item:		none				

Number of maintenance vehicles per maintenance base

Maintenance Base [km]	km	Road Vehicles	Multi- purpose vehicles (MPV)
1213.480	14.200	1	1
1155.580	57.900	1	1
1097.680	57.900	1	1
1035.730	61.950	1	1
973.780	61.950	1	1
935.766	38.014	1	1
836.885	98.881	1	1
770.964	65.921	1	1
680.252	90.712	1	1
619.777	60.475	2	1
560.772	59.005	1	1
501.768	59.005	1	1
413.261	88.507	1	1
362.749	50.512	1	1
307.115	55.634	1	1
243.807	63.309	1	1
180.498	63.309	1	1
96.089	84.410	1	1
11.679	84.410	1	1
Total	1216.001	20	19



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	Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor								
Del. 6	: Updating Construction an	d Operating Costs	Development of Capital Unit Cost, CAD						
Tec	hnology: X E300+	Sub-System:	K	Maintenance facilities					
	<u> </u>	Sector:	4	Construction					
	× F200+	Item:	2	Maintenance Vehicles Signalling/Telecom					
		Sub-item:		none					

Item	No	Unit price [\$]	Total
Road Vehicles	20	80 000	1 600 000
Multi- purpose vehicles (MPV)	19	800 000	15 200 000
Total	39		16 800 000

Total costs for maintenance vehicles

\$ 16 800 000

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Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor									
Del. 6 : Updating Construction and Operating Costs					Development of Capital Unit Cost, CAD				
Techno	logy: x	E300+	Sub-System:	K	Maintenance facilities				
			Sector:	4	Construction				
	х	F200+	Item:	3	Maintenance Vehicles Track				
			Sub-item:		none				

Number of maintenance vehicles per maintenance base

Maintenance Base [km]	Multi- purpose vehicles	Ultrasonic meassureme nt vehicle	Geometric meassureme nt vehicle	Track Working Vehicle	Road Vehicles
1213,480	1	-	-	-	1
1155,580	1	-	-	-	1
1097,680	-	-	-	1	1
1035,730	1	-	-	-	1
973,780	1	-	-	-	1
935,766	-	-	-	1	1
836,885	1	-	-	-	1
770,964	1	-	-	-	1
680,252	1	-	-	-	1
619,777	-	1	1	1	1
560,772	1	-	-	-	1
501,768	1	-	-	-	1
413,261	1	-	-	-	1
362,749	-	-	-	1	1
307,115	1	-	-	-	1
243,807	1	-	-	-	1
180,498	-	-	-	1	1
96,089	1	-	-	-	1
11,679	1	-	-	-	1
Total	14	1	1	5	19



Date:	2009-	09-19			Page: 2 of 2			
Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor								
Del. 6 : Updati	ng Con	struction and	Operating Costs		Development of Capital Unit Cost, CAD			
Technology:	х	E300+	Sub-System:	K	Maintenance facilities			
			Sector:	4	Construction			
	Х	F200+	Item:	3	Maintenance Vehicles Track			
			Sub-item:		none			

Item	No	Unit price [\$]	Total
Multi- purpose vehicles (MPV)	14	800 000	11 200 000
Ultrasonic meassurement vehicle	1	3 200 000	3 200 000
Geometric meassurement vehicle	1	3 200 000	3 200 000
Track working vehicle (GAF)	5	2 300 000	11 500 000
Road Vehicles	19	80 000	1 520 000
Total		40	30 620 000

Total costs for maintenance vehicles

\$ 30 620 000



Date:	2010-0	6-30			Page: 1 of 2			
Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor								
Del. 6 : Սլ	Del. 6 : Updating Construction and Operating Costs Development of Capital Unit Cost, CAD							
Techno	logy: x	E300+	Sub-System:	K	Maintenance facilities			
	<u></u> -		Sector:	4	Construction			
	×	F200+	Item:	4	Snow Fighting Vehicles			
			Sub-item:		none			

Number of snow fighting vehicles per maintenance base

Maintenance Base [km]	Snow jet	Snow fighter	Snow blower
1213.480	-	-	2
1155.580	-	-	2
1097.680	-	-	2
1035.730	-	-	2
973.780	-	-	2
935.766	-	-	2
836.885	-	-	2
770.964	-	-	2
680.252	-	-	2
619.777	-	-	2
560.772	-	-	2
501.768	-	-	2
413.261	-	-	2
362.749	-	-	2
307.115	-	-	2
243.807	-	-	2
180.498	-	-	2
96.089	-	-	2
11.679	-	-	1
Total	0	0	37



Date: 20°	10-06-30					Page: 2 of 2		
	Updated Fe	asibility Study o	f a Hi	gh Speed Ra	il Service			
in the Québec City – Windsor Corridor								
Del. 6 : Updating C	construction and	Operating Costs		Development	of Capital Unit (Cost, CAD		
Technology: x	E300+	Sub-System:	K	Maintenance fa	acilities			
	F200+	Sector:	4 4	Construction Snow Fighting	Vahialas			
Х	F200+	Item: Sub-item:	4	none	veriicies			
	Item		No	Unit price [\$]	Total			
	ILGIII		INO	Office [\psi]	Total			
	Snow jet		0	700 000	0			
	Snow fighter		0	400 000	0			
	Snow blower		37	5 000 000	185 000 000			
	Total		37		185 000 000			
	Total agets for	r maintenance ve	hioloo			\$ 185 000 000		

By: Hans Frank Förster, DBI

Continued:

EcoTrain

Date:	2010	-06-30			Page: 1 of 2
		Updated Fe	asibility Study o	f a H	ligh Speed Rail Service
		in t	he Québec City	– Wir	indsor Corridor
Del. 6 : Upda	ting Cor	struction and	Operating Costs		Development of Capital Unit Cost, CAD
Technolog	y: 🗍	E300+	Sub-System:	K	Maintenance facilities
			Sector:	4	Construction
	Х	F200+	Item:	5	Maintenance bases
			Sub-item:	5.1	Maintenance bases - Diesel operation
Building	gs - Unit	Costs			
Space per person		20	m²/p	person	
Construc	ction cos	st*	3 500	\$/m²	2

Maintenance Base [km]	Personnel Track	Personnel Electrificatio n	Personnel Signals / Telecom	Total Personnel	Area [m²]	Cost [\$]
1207.557	4	4	4	12	240	840 000
1149.657	4	4	4	12	240	840 000
1091.757	4	4	4	12	240	840 000
1029.807	4	4	4	12	240	840 000
967.857	4	4	4	12	240	840 000
929.843	4	4	4	12	240	840 000
830.715	4	4	4	12	240	840 000
764.629	4	4	4	12	240	840 000
673.917	4	4	4	12	240	840 000
613.442	4	4	4	12	240	840 000
555.256	4	4	4	12	240	840 000
497.069	4	4	4	12	240	840 000
409.790	4	4	4	12	240	840 000
359.278	4	4	4	12	240	840 000
303.645	4	4	4	12	240	840 000
243.430	4	4	4	12	240	840 000
183.215	4	4	4	12	240	840 000
97.447	4	4	4	12	240	840 000
11.679	4	4	4	12	240	840 000
Total	76	76	76	228	4 560	15 960 000

(*) Source MMM



By: Ottmar Grein, DBI

Continued:



Date:	2010-	-06-30				Page: 2 of 2			
	Updated Feasibility Study of a High Speed Rail Service								
	in the Québec City – Windsor Corridor								
Del. 6 : Updating Construction and Operating Costs				Dev	elopment of Capital Unit Cost, CA				
Technol	logy:	E300+	Sub-System:	K	Maintenance f	acilities			
			Sector:	4	Construction				
	Х	F200+	Item:	5	Maintenance b	pases			
			Sub-item:	5.1	Maintenance b	pases - Diesel operation			

Covering - Quantities and Costs

Maintenance Base [km]	Rail Vehicles total	No. of Storage Tracks	Storage Track Length [m]	Storage Area [m²]	Cost of Covering [\$]
1207.557	4	3	180	720	720 000
1149.657	4	3	180	720	720 000
1091.757	4	3	180	720	720 000
1029.807	4	3	180	720	720 000
967.857	4	3	180	720	720 000
929.843	4	3	180	720	720 000
830.715	4	3	180	720	720 000
764.629	4	3	180	720	720 000
673.917	4	3	180	720	720 000
613.442	6	3	180	720	720 000
555.256	4	3	180	720	720 000
497.069	4	3	180	720	720 000
409.790	4	3	180	720	720 000
359.278	4	3	180	720	720 000
303.645	4	3	180	720	720 000
243.430	4	3	180	720	720 000
183.215	4	3	180	720	720 000
97.447	4	3	180	720	720 000
11.679	3	2	120	480	480 000
Total	77	56	3 360	13 440	13 440 000

Buildings total \$ 15 960 000 Covering total \$ 13 440 000

Total costs for maintenance bases

\$ 29 400 000

EcoTrain	By: Ottmar Grein, DBI	Continued:

Date: 2010-06-30 Page: 1 of 2 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor **Del. 6: Updating Construction and Operating Costs Development of Capital Unit Cost, CAD** Technology: X Maintenance facilities E300+ Κ Sub-System: Sector: Construction F200+ Item: 5 Maintenance bases Sub-item: 5.2 Maintenance bases - Electric operation **Buildings - Unit Costs** Space per person 20 m²/person

3 500 \$/m²

Buildings - Quantities and Costs

Construction cost*

Maintenan ce Base [km]	Personnel Track	Personnel Electrificati on	Personnel Signals / Telecom	Total Personnel	Area [m²]	Cost [\$]
1227.680						
1213.480	4	8	4	16	320	1 120 000
1155.580	4	8	4	16	320	1 120 000
1097.680	4	33	4	41	820	2 870 000
1035.730	4	8	4	16	320	1 120 000
973.780	4	8	4	16	320	1 120 000
935.766	4	33	4	41	820	2 870 000
836.885	4	8	4	16	320	1 120 000
770.964	4	8	4	16	320	1 120 000
680.252	4	8	4	16	320	1 120 000
619.777	4	33	4	41	820	2 870 000
560.772	4	8	4	16	320	1 120 000
501.768	4	8	4	16	320	1 120 000
413.261	4	8	4	16	320	1 120 000
362.749	4	33	4	41	820	2 870 000
307.115	4	8	4	16	320	1 120 000
243.807	4	8	4	16	320	1 120 000
180.498	4	33	4	41	820	2 870 000
96.089	4	8	4	16	320	1 120 000
11.679	4	8	4	16	320	1 120 000
Total	76	277	76	429	8 580	30 030 000

(*) Source MMM



Date:	2010-06-30			Page: 2 of 2			
Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor							
Del. 6 : Updating Construction and Operating Costs			Development of Capital Unit Cost, CAD				
Technolo	ogy: X E300+	Sub-System:	K	Maintenance facilities			
		Sector:	4	Construction			
	F200+	Item:	5	Maintenance bases			
		Sub-item:	5.2	Maintenance bases - Electric operation			

Covering - Quantities and Costs

Maintenance Base [km]	Rail Vehicles total	No. of Storage Tracks	Storage Track Length [m]	Storage Area [m²]	Cost of Covering [\$]
1213.480	6	3	180	720	720 000
1155.580	6	3	180	720	720 000
1097.680	9	4	240	960	960 000
1035.730	6	3	180	720	720 000
973.780	6	3	180	720	720 000
935.766	10	5	300	1 200	1 200 000
836.885	6	3	180	720	720 000
770.964	6	3	180	720	720 000
680.252	6	3	180	720	720 000
619.777	11	5	300	1 200	1 200 000
560.772	6	3	180	720	720 000
501.768	6	3	180	720	720 000
413.261	6	3	180	720	720 000
362.749	10	5	300	1 200	1 200 000
307.115	6	3	180	720	720 000
243.807	6	3	180	720	720 000
180.498	9	4	240	960	960 000
96.089	6	3	180	720	720 000
11.679	5	3	180	720	720 000
Total	132		3 900	15 600	15 600 000

 Buildings total
 \$ 30 030 000

 Covering total
 \$ 15 600 000

Total costs for maintenance bases

\$ 45 630 000

EcoTrain By: Ottmar Grein, DBI Continued:	
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Date: 20	010-06-30					Page: 1 of 1
	Updated Fea	sibility Study of	a H	igh Speed Ra	ail Service	
	in th	ne Québec City –	Wii	ndsor Corrido	or	
Del. 6 : Updating (Construction and	Operating Costs		Developmen	t of Capital Unit	t Cost, CAD
Technology: x	E300+	Sub-System:	K	Maintenance f	acilities	
_	-	Sector:	4	Construction		
х	F200+	Item:	6		istration Building	l
		Sub-item:		none		
Basic assum	ptions:			min	ma	ıX
Net area per v	working place			6 m ²		
•	er working place			13.5 m²		
·	per working plac	e		2	0 m²	
Source: DBI						
Mean capital	cost per m²			\$3	3 500	
Source: MMM						
	Total costs for	central administ	ratio	n building		
	per person					\$ 70 000
		T				
S Eco	Train	By: Hans Frank Fö	rster,	DBI	Continued	d:

Date: 2009-0	09-19					Paç	ge: 1 of 1
		sibility Study o					
		e Québec City	– Wir	ndsor Corrido	or		
Del. 6 : Updating Cons	struction and (Operating Costs		Developmen	t of Capital Unit	Cost	, CAD
Technology: x	E300+	Sub-System:		Maintenance f	acilities		
	F200+	Sector: Item:		Construction Train Wash			
х	Γ 2 00+	Sub-item:	1	none			
Numer of train wa	ash	2		at shop			
Cost per train was		20 000 000	\$				
Total cost		40 000 000					
			-		I		
 	otal costs for	troin wash				<u>φ</u>	40 000 000
<u>'</u>)lai 60515 ioi	traiii wasii				\$	40 000 000
EcoTra	in	By: Hans Frank Fo	örster	. DBI	Continued	1:	$\overline{\Box}$
OUENEC-WINDSON		by: Hano Hank I	5,0,0,,	, 55.	30111111400		

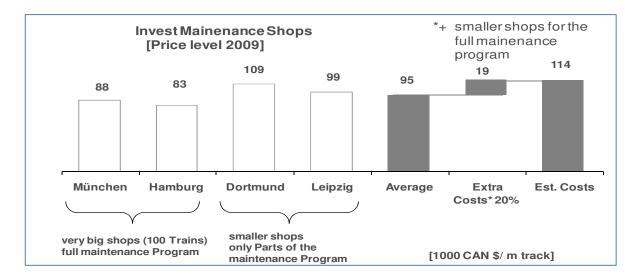
- 2222 00 10	1		1 _ , , ,
Date: 2009-09-19	1		Page: 1 of 1
		of a High Speed Ra	
		– Windsor Corrid	
Del. 6 : Updating Construction and	Operating Costs	Developmen	nt of Capital Unit Cost, CAD
Technology: x E300+	Sub-System:		facilities
x F200+	Sector:		enance Depots
<u>×</u> F200+	Sub-item:		enance bepois
Numer of depots	4]
Cost per depot	5 000 000		
Total cost	20 000 000		
Total cost	20 000 000	Φ	1
Total costs fo	r central mainter	nance depots	\$ 20 000 00
EcoTrain	By: Hans Frank F	örster, DBI	Continued:

Pate: 2010-06-30					Page: 1 of 2	
	Updated Feasibility Study of a High Speed Rail Service					
	in th	e Québec City	 Windsor Corride 	or		
Del. 6 : Updating C	onstruction and	Operating Costs	Developmen	t of Capital Unit C	Cost, CAD	
Technology:	E300+	Sub-System:	K Maintenance f	facilities		
v	F200+	Sector: Item:	4 Construction9 Yards (Roof)			
Х	F200+	Sub-item:	none			
Unit cost per	m ² of covering					
Length of storage track		220	m			
Spare tracks		1				
Track distance)	4	m			
Cost per m ² covering		1 000	\$/m²			
F200+						
Station	Storage Tracks	Spare tracks	Storage Area [m²]	Cost of Coverage [\$]		
Québec	6	1	6 160	6 160 000		
Montreal	20	1	18 480	18 480 000		
Ottawa	4	1	4 400	4 400 000		
Toronto	25	1	22 880	22 880 000		
Windsor	7	1	7 040	7 040 000		
Total	62	5	58 960	58 960 000		
E300+						
Station	Storage Tracks	Spare tracks	Storage Area [m²]	Cost of Coverage [\$]		
Québec	5	1	5 280	5 280 000		
Montreal	18	1	16 720	16 720 000		
Ottawa	3	1	3 520	3 520 000		
Toronto	22	1	20 240	20 240 000		
Windsor	6	1	6 160	6 160 000		
Total	54	5	51 920	51 920 000		
EcoTrai	n	By: Ottmar Grein,	DBI	Continued:		

2010-06-30 Date: Page: 1 of 1 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor Del. 6: Updating Construction and Operating Costs **Development of Capital Unit Cost, CAD** Technology: X Κ Maintenance facilities E300+ Sub-System: Construction Sector: 10 Shops F200+ Item: Sub-item: none

Unit cost per shop

including tracks, building, equipment



Number of shops	2	
Length of working track	200	m
Unit cost	114 000	\$/working m

Location	No of Working Tracks	Total Length of Working Tracks [m]	Total Cost [\$]
Montreal	3	600	68 400 000
Toronto	3	600	68 400 000
Total	6	1 200	136 800 000

Total costs for shops

\$ 136 800 000

EcoTrain	By: Hans Frank Förster, DBI	Continued:
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Date:	2010-06-3	30					Page: 1 of 2
	Up		asibility Study one Québec City		•		
Del. 6 : Up	dating Constru	ction and	Operating Costs		Developmen	nt of Capital Unit Cos	st, CAD
Technol	ogy: E	E300 +	Sub-System:	K	Maintenance f	acilities	
			Sector:	4	Construction		
	X F	- 200+	Item:	11	Track and Pov	ver Supply	
			Sub-item:	11.1	Ballast Track of	on earthworks	

Tracks in Maintenance bases

Maintenance Base [km]	Storage Track Length [m]	Mainline Access [m]	Additional Track for Crossovers [m]	Total Length of Track [m]
1207.557	180	500	150	830
1149.657	180	500	150	830
1091.757	180	500	150	830
1029.807	180	500	150	830
967.857	180	500	150	830
929.843	180	500	150	830
830.715	180	500	150	830
764.629	180	500	150	830
673.917	180	500	150	830
613.442	180	500	150	830
555.256	180	500	150	830
497.069	180	500	150	830
409.790	180	500	150	830
359.278	180	500	150	830
303.645	180	500	150	830
243.430	180	500	150	830
183.215	180	500	150	830
97.447	180	500	150	830
11.679	120	500	50	670
	3 360	9 500	2 750	15 610



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	Į	Jpdated Fea	sibility Stud	ly of a High	Speed Rail	Service	
		in th	e Québec C	ity – Windso	or Corridor		
el. 6 : Updating C	onsi	truction and C	perating Cos	ts De	velopment o	f Capital Unit (Cost, CAD
Technology:		E300+	Sub-Syste		ntenance facili	ities	
v		F000	Sect		struction	Cumply	
X		F200+	Ite Sub-ite	m: 11 Trad m: 11.1 Balla	ck and Power ast Track on e		
Tracks in Yar	ds						
					Storage	Additional	Total Length
Station		Mainline	Storage	Spare tracks	•	Tracks for	of single
		Access [km]	Tracks		[m]	Crossovers [m]	Track [m]
L'Áncienne-Lor	ette	4	6	1	1 540	700	6 240
Montreal		5	20	1	4 620	5 775	15 395
Ottawa		2	4	1	1 100	375	3 475
Toronto		7	25	1	5 720	8 450	21 170
Windsor Total		2 20	7 62	1 5	1 760 14 740	800 16 100	4 560 50 840
Total		20	02		14 /40	10 100	30 040
Mainline Acce Location Montreal Toronto		Mainline ccess [km] 5					
Total		12					
Tracks in Mair Tracks in Yard Tracks in Shop	ls	ance bases			15 610 m 50 840 m 12 000 m		
Total				7	78 450 m		
Unit price per	km	track (see w	orksheet F-4	4-1) 9	38 500 \$		
ר	Γotal	cost for F200+:	78.450 k	km x 938	500 \$ = 7	73 625 325 \$	
	Tot	al costs for E	Ballast Track	on earthwo	rks	[\$ 73 625 325

EcoTrain	By: Hans Frank Förster, DBI	Continued:
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Date:	2010-0	6-30			Page: 1 of	2
	l	•	easibility Study of the Québec City		High Speed Rail Service indsor Corridor	
Del. 6 : Up	dating Cons	truction and	Operating Costs		Development of Capital Unit Cost, CAD	_
Technol	ogy: X	E300+	Sub-System:	: K Maintenance facilities		
			Sector:	4	Construction	
		F200+	Item:	11	Track and Power Supply	
			Sub-item:	11.1	Ballast Track on earthworks	

Tracks in Maintenance bases

Maintenance Base [km]	Storage Track Length [m]	Mainline Access [m]	Additional Track for Crossovers [m]	Total Length of Track [m]
1213.480	180	500	150	830
1155.580	180	500	150	830
1097.680	240	500	200	940
1035.730	180	500	150	830
973.780	180	500	150	830
935.766	300	500	375	1 175
836.885	180	500	150	830
770.964	180	500	150	830
680.252	180	500	150	830
619.777	300	500	375	1 175
560.772	180	500	150	830
501.768	180	500	150	830
413.261	180	500	150	830
362.749	300	500	375	1 175
307.115	180	500	150	830
243.807	180	500	150	830
180.498	240	500	200	940
96.089	180	500	150	830
11.679	180	500	150	830
Total	3 900	9 500	3 625	17 025

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Updated Feasibility Study of a High Speed Rail Service							
	in the Québec City – Windsor Corridor						
Del. 6 : Upda	ting Construction a	and Operating Costs		Development of Capital Unit Cost, CAD			
Technolog	ıy: x E300+	Sub-System:	K	Maintenance facilities			
		Sector:	4	Construction			
	F200+	Item:	11	Track and Power Supply			
		Sub-item:	11.1	Ballast Track on earthworks			

Tracks in Yards

Station	Mainline Access [km]	Storage Tracks	Spare Tracks	Storage Track Length [m]	Additional Tracks for Crossovers [m]	Total Length of single Track [m]
L'Ancienne-Lorette	4	5	1	1 320	450	5 770
Montreal	5	18	1	4 180	4 750	13 930
Ottawa	2	3	1	880	200	3 080
Toronto	7	22	1	5 060	6 900	18 960
Windsor	2	6	1	1 540	700	4 240
Total	20	54	5	12 980	13 000	45 980

Mainline Access to Shops

Location	Mainline Access [km]
Montreal	5
Toronto	7
Total	12

Tracks in Maintenance bases	17 025 m
Tracks in Yards	45 980 m
Tracks in Shops	12 000 m

Total 75 005 m

Unit price per km track (see worksheet F-4-1) 938 500 \$

Total cost for E300+: $75.005 \text{ km} \times 938500 \$ = 70392193 \$$

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	Updated Fea	asibility Study	of a H	igh Speed Ra	il Service	
	in th	ne Québec City	– Wiı	ndsor Corrido	or	
Del. 6 : Updating Co	nstruction and O	perating Costs		Developmer	nt of Capital Unit C	Cost, CAD
Technology: X	E300+	Sub-System:	K	Maintenance fa	acilities	
_		Sector:		Construction	O	
	F200+	Item:			er Supply n/h deviation speed	Ī
		Sub-item.	11.2	Tamout Co Ki	Tim deviation opeoc	•
Turnouts in ma	intenance hase	e		Turnouts in \	/arde	
ramouto in ma	menance suse	3		ramouto iii		
Maintenance	Switches				Switches	
Base [km]	EW500			Station	EW500	
1213.480	1			Québec	1	
1155.580	1			Montreal	1	
1097.680	1			Ottawa	1	
1035.730	1			Toronto	1	
973.780	1			Windsor	1	
935.766	1			Total	5	
836.885	1					
770.964	1		Maint	. bases	19	
680.252	1		Yards		5	
619.777	1		Total		24	
560.772	1		11.21	2/. 21.1. 1		
501.768	1			rice/switch vorksheet F-		
413.261	1		4.7)	wie e /esseite de	200 000 \$	
362.749	1		heate	rice/switch r (see		
307.115	1			sheet F-4.9)	130 000 \$	
243.807	1					
180.498	1	24		200 000 \$		
96.089	1	24	X	130 000 \$	= 3 120 000 \$	Switch Heaters
11.679	1					
Total	19					

EcoTrain	By: Hans Frank Förster, DBI
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Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor						
Del. 6 : Updating Construction and Operating Costs Development of Capital Unit Cost, CAD						
		1/	Maintenance fac	• ,		
Technology: E300+	Sub-System: Sector:	κ 1	Construction	cinities		
x F200+	Item:	11	Track and Powe	er Supply		
	Sub-item:	11.2	Turnout - 60 km	/h deviation speed		

Turnouts in maintenance bases

Maintenance Base [km]	Switches EW500
1207.557	1
1149.657	1
1091.757	1
1029.807	1
967.857	1
929.843	1
830.715	1
764.629	1
673.917	1
613.442	1
555.256	1
497.069	1
409.790	1
359.278	1
303.645	1
243.430	1
183.215	1
97.447	1
11.679	1
Total	19

Turnouts in Yards

Station	Switches EW500
Québec	1
Montreal	1
Ottawa	1
Toronto	1
Windsor	1
Total	5

Total	24
Yards	5
Maint. bases	19

Unit price/switch	
(see worksheet F-	
4.7)	200 000 \$
Unit price/switch	
heater (see	
worksheet F-4.9)	130 000 \$

24 x 200 000 \$ = 4 800 000 \$ Switches 24 x 130 000 \$ = 3 120 000 \$ Switch Heaters

By: Hans Frank Förster, DBI

Continued:

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Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor						
Del. 6 : Updating Construction and Operating Costs				Development of Capital Unit Cost, CAD		
Tech	nnology: E300	+	Sub-System:	K	Maintenance facilities	
	<u> </u>		Sector:	4	Construction	
	X F200	+	Item:	11	Track and Power Supply	
			Sub-item:	11.3	Turnout -40 km/h deviation speed	

Turnouts in maintenance bases

Maintenance	Switches
Base [km]	EW190
1207.557	2
1149.657	2
1091.757	2
1029.807	2
967.857	2
929.843	2
830.715	2
764.629	2
673.917	2
613.442	2
555.256	2
497.069	2
409.790	2
359.278	2
303.645	2
243.430	2
183.215	2
97.447	2
11.679	1
Total	37

Turnouts in Yards

Station	Switches EW190
Québec	6
Montreal	20
Ottawa	4
Toronto	25
Windsor	7
Total	62

37 Maint. bases 62 Yards

99 turnouts 40km/h Total

Unit price switch	
(see worksheet F-	
4.10)	140 000 \$
Unit price switch	
heater (see	
worksheet F-4.11)	100 000 \$

99 x 140 000 \$ = 13 860 000 \$ Switches 99 x 100 000 \$ = 9 900 000 \$ Switch He

100 000 \$ = 9 900 000 \$ Switch Heaters

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Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor						
Del. 6 : Updating Construction and Operating Costs			Operating Costs	Development of Capital Unit Cost, CAD		
Techno	logy: X E	300+	Sub-System:	K	Maintenance facilities	
	-		Sector:	4	Construction	
	F:	200+	Item:	11	Track and Power Supply	
			Sub-item:	11.4	Catenary - OCS yards, stations	

Tracks in Yards

Station	Mainline Access [km]	Storage Tracks	Spare Tracks	Storage Track Length [m]	Additional Tracks for Crossovers [m]	Total Length of single Track [m]
L'Ancienne-Lorette	4	5	1	1 320	450	5 770
Montreal	5	18	1	4 180	4 750	13 930
Ottawa	2	3	1	880	200	3 080
Toronto	7	22	1	5 060	6 900	18 960
Windsor	2	6	1	1 540	700	4 240
Total	20	54	5	12 980	13 000	45 980

Mainline Access to Shops

Location	Mainline Access [km]
Montreal	5
Toronto	7
Total	12

Tracks in yards: 45 980 m

Tracks for access to shops: 12 000 m

Total Length of Catenary (OCS) 57 980 m

Unit price per km OCS (see worksheet G-4-1.3) 378 000 \$

57.980 km x 378 000 \$ = 21 916 440 \$



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Updated Feasibility Study of a High Speed Rail Service						
in the Québec City – Windsor Corridor						
Del. 6 : Updating Cons	Del. 6 : Updating Construction and Operating Costs Development of Capital Unit Cost, CAD					
			<u>-</u>	-		
Technology: X	E300+	Sub-System: Sector:	K Maintenance fac4 Construction	intes		
	F200+	Item:	11 Track and Power	r Supply		
1		Sub-item:	11.5 Catenary above			
Catenary above s	witches					
Caterially above S	Wilches					
Unit Price (*)	80 000 \$	per switch				
(*) Sou	urce: DB KoRil	808.0212 Listing of	f characteristic unit cost	s for railway		
pro	jects, 1998; Cr	osschecked with c	urrent DB Procurement			
per	r year; Exchang	ge rate CAN - EUR	: 1.566			
EcoTrain	1	By: Hans Frank Fo	örster, DBI	Continued:		

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Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor						
Del. 6 : Updating Construction and Operating Costs				Development of Capital Unit Cost, CAD		
Techr	nology: X	E300+	Sub-System:	K	Maintenance faci	lities
	<u> </u>		Sector:	4	Construction	
	X	F200+	Item:	12	Land acquisition	
			Sub-item:		none	

For each geographic or functional segment, the mean unit price per ha will be derived from Items 1 to 5 of Sector 4 of Subsystem A (Land Acquisition) in the Cost Model (rounded to the nearest 1000 \$)

Areas of Land Acquisition for O&M Facilities:

F200+

	Maintenance Bases	Central Administration Building	Yards	Shops	Total	Hectares
	[m ²]	[m ²]	[m ²]	[m ²]	[m ²]	
Québec-Montreal	26 600		24 960		51 560	5
Montreal-Ottawa	15 960	704	103 480	40 000	160 144	16
Ottawa-Toronto	31 920		112 680	56 000	200 600	20
Toronto-Windsor	25 960		26 240		52 200	5
Total	100 440	704	267 360	96 000	464 504	46

E300+

	Maintenance Bases	Central Administration Building	Yards	Shops	Total
	[m ²]	[m ²]	$[m^2]$	[m ²]	$[m^2]$
Québec-Montreal	27 040		23 080		50 120
Montreal-Ottawa	17 340	791	96 040	40 000	154 171
Ottawa-Toronto	34 680		103 840	56 000	194 520
Toronto-Windsor	27 040		24 960		52 000
Total	106 100	791	247 920	96 000	450 811

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Updated		y of a High Speed Ra ity – Windsor Corrido		
Del. 6 : Updating Construction and	Operating Costs	Developme	nt of Capital Unit Co	st, CAD
Technology: X E300+ X F200+	Sub-System: Sector: Item: Sub-item:	L Information - Tick 1 Professional Serv 1 Engineering none	eting rices / Project Manage	ement
		Man powe	r in man days	
Field of Activity		Preparation, specification and planning	Implementation of project over 18 month.	
Passenger Transportation Bac	k End SW	1 320	11 550	
Ticketing Machines & SW Inte	gration	880	1 320	
POS OTC Sales at Stations &	SW Integration	880	1 320	
Internet Server, SW-Developm	ent & Integration	440	660	
eTicketing		440	660	
IT Operations and IT Support		660	1 110	
Roll-Out & Training		220	330	
Total		4 840	16 950	
Grand total			790	
Total [manmonths)		1	038	
Costs per manmonth				31 500 \$
1 038 x 31 500 \$	= 32 697 000 \$			
Total costs for	Engineering		\$ 32 697 000	
Source: DB Systel, Septenber				
EcoTrain	By: Hans Frank Förs	ter, DBI	Continued:	>

Date: 2009-09-20				Page: 1 of 1
Updat	ed Feasibility Study of in the Québec City	• •		
Del. 6 : Updating Construction	n and Operating Costs	Developmer	nt of Capital Unit Cos	t, CAD
Technology: X E300+	Sector:	L Information - Ti 1 Professional Se 4 Project Manage none	ervices / Project Mana	gement
Field of Activity		Preparation,	er in man days Implementation of project over 18 month.	
Project Management		920	3 221	
Total		920	3 221	
Grand total		4	140	
Total [manmonths)			197	
Costs per manmonth 197 x 31 500	\$ = 6 205 500 \$			31 500 \$
Total cost	s for Project Manager	nent	\$ 6 205 500	
Source: DB Systel, Septe	nber 2009			
EcoTrain	By: Hans Frank För	ster, DBI	Continued:	3 >

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	Updated Fea	asibility Study of	f a Hi	igh Speed Rail	Service	
	in tl	he Québec City -	- Wir	ndsor Corridor		
el. 6 : Updating Con	struction and	Operating Costs		Development of	of Capital Unit	Cost, CAD
Technology: x	E300+	Sub-System: Sector:	L 4	Information - Tic Construction	keting	
х	F200+	Item: Sub-item:	1	Passenger Trans	sportation Back	kend Software
portal server, time	e table and ro	on servers, e-mail outing engines, prid				
reservation syster	11)				150 000 €	€
		1 €	=	1.50 \$		
				Unit price	225 000 8	5
				Units		1
				Total costs	225 000 \$	}
Total costs for P	assenger Tr	ansportation Bac	kend	d Software		225 000
Source: DB Syste	el, Septenber	2009				

By: Hans Frank Förster., DBI

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Continued:

EcoTrain

Date: 2010-06-30 Page: 1 of 1 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor **Del. 6: Updating Construction and Operating Costs Development of Capital Unit Cost, CAD** Technology: x Information - Ticketing E300+ L Sub-System: Construction Sector: 4 **Ticketing Machines** F200+ 2 Item: Sub-item: none Ticketing machine 80 000 € 1.50 \$ 1€ = 120 000 \$ Unit price Source: DB Systel, Septenber 2009 **D**

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Continued:

EcoTrain

Date: 2010-0)6-30				Page: 1 of 1	
		asibility Study of				
			- Windsor Corridor			
Del. 6 : Updating Cons				Development of Capital Unit Cost, CAD		
Technology: x	E300+	Sub-System: Sector:	L 4	Information - T Construction	icketing	
X	F200+	Item:	3	Hardware for 0	Counters at Stations	
		Sub-item:		none		
Counter hardware		0.000.6				
	1.50 \$	8 000 €				
1€ =	1.50 φ					
	Unit price	12 000 \$				
	Unit price	.= 000 4				
Source: DB Systel, Septenber 2009						
330.30. = = 3,	Oddice. DB Gystel, deptember 2003					
EcoTrai	EcoTrain By: Hans Frank Fö				Continued:	

Date: 2010-06-30 Page: 1 of 1 Updated Feasibility Study of a High Speed Rail Service in the Québec City - Windsor Corridor **Del. 6: Updating Construction and Operating Costs Development of Capital Unit Cost, CAD** Technology: x Information - Ticketing E300+ Sub-System: L Construction Sector: Internet Server F200+ 4 Item: Sub-item: none 1 central website for reservation and ticket sales 80 000 € 1 € = 1.50 \$ 120 000 \$ Unit price Units 1 Total costs 120 000 \$ **Total costs for Internet Server** 120 000 \$ Source: DB Systel, Septenber 2009 **B** By: Hans Frank Förster., DBI **EcoTrain** Continued:

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	Updated Feasibility Study of a H								
	in the Québec City – Windsor Corridor								
Del. 6 : Updating Con	struction and	Operating Costs		Developmen	t of Capital Ur	nit Co	st, CAD		
Technology: x	E300+	Sub-System:	L	Information - T	icketing				
		Sector:	4	Construction					
X	F200+	Item: Sub-item:	5	eTicketing none					
		Sub-itelli.		HOHE					
SMS and Email S	Server Infrastr	ucture			50 000	n <i>E</i>			
		a otal o			30 000	<i>) E</i>			
		1 €	=	1.50 \$					
		I€	=	1.50 ψ					
				I Init price	75 000	\$			
				Unit price	70 000	Ψ			
				Units	75.000	l T			
				Total costs	75 000	\$			
Total costs for	eTicketing						75 000 \$		
Source: DB Syst	Source: DB Systel, Septenber 2009								
mis T	in	Ry: Hans Frank För	retor	DRI	Continu	od.			
EcoTra	ın	By: Hans Frank För	เรเษก	וסט,	Continu	eu.	Ш		

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	Updated Fea	sibility Study of	аН	igh Speed Ra	il Service				
	in the Québec City – Windsor Corridor								
Del. 6 : Updating Cor	nstruction and (Operating Costs		Development	of Capital Un	it Cos	st, CAD		
Technology: X	E300+ F200+	Sub-System: Sector: Item:	L 4 6	Information - T Construction IT Data Center	-				
х	1 2007	Sub-item:	U	none					
Initial setup cost Total costs for Source: DB Syst	IT Data Cente	1 €		1.50 \$ Unit price Units Total costs	180 000 180 000	\$ 1	180 000 \$		
EcoTra	in	By: Hans Frank För	rster	., DBI	Continue	ed:			

Date: 2009-08-12				Pa	ge: 1 of 1			
Updated Fea	asibility Study of	f a Hi	gh Speed Ra	ail Service				
in th	ne Québec City -	- Wir	dsor Corrido	or				
Del. 6 : Updating Construction and	Operating Costs		Developmen	t of Capital Unit Cos	t, CAD			
Technology: × E300+	Sub-System:	М	Startup					
- F000	Sector:	4	Construction	~				
× F200+	Item: Sub-item:	1	Commissionin	9				
	,							
Commissioning includes the final testing and adjustment of all components of an HSR-System after the infrastructure and the rolling stock has been handed over from suppliers to client.								
Special points of interest are to	ests of the interact	ion o	f different com	ponents:				
 High speed test runs to prove catenary and pantograph 	- High speed test runs to prove save interaction between rail and wheel as well as catenary and pantograph							
- Intensive tests of high voltage	e systems and the	ir imp	acts on other	sub-systems.				
- Tests of safety systems and	- Tests of safety systems and their interaction with other sub-systems							
- Signal / Communication test	with running vehic	les						
- Rescue simmulations (trainin	g)							
QOHSRP (System Operation a commissioning as 2 % of the commission operation since Dezember 200	ost for the railway at figures. The Swi	tech	nical infrastrud	cture.				
Railway technical infrastructure	9		1 07	bil. Swiss Francs				
Commissioning			_	mil. Swiss Francs				
Percentage			1.9					
Not included is the approval of rolling stock, wich has to be provided by the supplier								
Commissioning will trail the co				•				
EcoTrain	By: Ottmar Grein,	DBI		Continued:				

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Updated Feasibility Study of a High Speed Rail Service									
in the Québec City – Windsor Corridor									
Del. 6 : Updating Construction and Operating Costs				Developmen	t of Capital Unit Cost, CAD				
Technology: x	E300+	Sub-System:	М	Startup					
		Sector:	4	Construction					
х	F200+	Item:	2	Administration	Allowance				
		Sub-item:							
The 1995 study has made the following assumptions for the build-up of the HSR administration: # The administration during the construction period has been estimated in the initial year of construction at five per cent of the final expenses developed for the executive and administration categories. The administrative expenses have been allowed to increase as construction proceeds so that the full number of executive and administrative employees are in place the year before each segment is open for operations. # The second component of administration includes the employment of the functional administrative staff (for example, the Chief of Transportation, maintenance supervisors, marketing professionals). Twenty per cent of these employees are put in place three years before a line segment is open for operations, with the remainder being brought on in the next two years so that the entire administrative and supervisory staff is in place the year each segment opens.									
This is a reasonable ap	oproach, which	can be confirmed.							
Staff quantities are	still not kno	wn as they depen	ıd on	the results if t	he demand forecast				
otan quantitioo are	, cuii riot iuio	m as mey depon	IG 011	tilo roodito ii t	no domana forodati				
EcoTrain	า	By: Hans Frank Fö	rster,	DBI	Continued:				

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	Updated Feasibility Study of a High Speed Rail Service in the Québec City – Windsor Corridor									
Del. 6 : Updating Construction and Operating Costs					Development of Capital Unit Cost, CAD					
Technolo	ogy: x	E300+	Sub-System:	М	Startup					
			Sector:	4	Construction					
	х	F200+	Item:	3	Training					
			Sub-item:							

Appropriate training of hourly-rated staff is a key element to the successful implementation of an HSR system. In the 1995 study the following approach has been followed:

- # All of the train crews and dispatchers will go through the pre-opening training, as will all customer service staff that fill front-line positions. A training allowance of five per cent was made for only seventy-five per cent of the equipment maintenance staff on the grounds there are no special skills or knowledge required for helpers and labourers. For infrastructure maintenance staff, only 60 per cent of the total staff are trained, again since labourers require no special knowledge that cannot be acquired on the job, and that a number of the specialized tradesmen require no additional specialized skills. The training allowances reflect standard overseas practice and are based on the use of existing railway (VIA) staff.
- # Employee training starts four years before commissioning the first line segment for the key staff and continues until each segment opens, with the bulk of the expenditures being undertaken during the two years immediately before each segment opens.
- # Training allowances were reduced by 25 per cent for last segment, on the grounds that the other sectors of the Corridor would already be in operation.

This reasonable approach can also be confirmed. However, the average training allowance per person stated in the 1995 study has to be adapted to the actual salary levels as follows:

Staff Group	1995	average increase	2009
Train crews	\$115 000	42%	\$164 000
Dispatchers	\$110 000	42%	\$157 000
Customer services	\$6 000	42%	\$9 000
Equip.maintenance	\$55 000	42%	\$79 000
Infrastruc. maintenance	\$85 000	42%	\$121 000

Staff quantities are still not known as they depend on the results if the demand forecast

EcoTrain By: Hans Frank Förster, DBI Continued:		By: Hans Frank Förster, DBI	Continued:	
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