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Item No. 9.1.2
Audit & Finance Standing Committee
October 21, 2015

TO: Chair and Members of Audit & Finance Standing Committee
Original Signed

SUBMITTED BY: Richard Butts, Chief Administrative Officer
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Eddie Robar, Director Halifax Transit

DATE: July 22, 2015

SUBJECT: Mini-Hybrid Thermal System for Halifax Transit Buses – Project Review

ORIGIN

Item 11.1.2 Award – Tender No 13-128, Mini-Thermal Hybrid Systems

LEGISLATIVE AUTHORITY

Halifax Regional Municipality Council approved, Dec 11, 2012, that all budget increases are to be presented to the Audit and Finance Standing Committee, prior to submission to Council.

Halifax Charter, section 93(1) - The Council shall make estimates of the sums that are required by the Municipality for the fiscal year; Halifax Charter, section 79(1) - Specifies areas that the Council may expend money required by the Municipality; Halifax Charter, section 35(2)(d)(i) - The CAO can only authorize budgeted expenditures or within the amount determined by Council by policy; Halifax Charter, section 120(6) - The Municipality may maintain other reserve funds for such purposes as the Council may determine; Halifax Regional Municipality policy on Changes to Cost Sharing for Capital Projects - Changes requiring Council approval; and the Halifax Regional Municipality Reserve Policy - No reserve funds will be expended without the CAO's recommendation and Council approval.

RECOMMENDATION

It is recommended that Chair and Members of Audit & Finance Standing Committee:

1. Terminate the Installation of Mini-Hybrid Thermal Systems on Halifax Transit buses manufactured between 2005 and 2007; a total of forty-three vehicles; of which fifteen have been budgeted for;
2. Reduce Project Account CM020006, Emission Reduction – Public Transit Buses for the installation of the Mini-Hybrid Thermal Systems on these buses as outlined in the Financial Implications Section; and
3. Continue the Installation of Mini-Hybrid Thermal Systems on nineteen (19) Halifax Transit buses manufactured between 2008 and 2009.

BACKGROUND

During January 2010, HRM conducted a feasibility study on the installation of Mini-Hybrid Thermal Systems on Halifax Transit buses. The mini hybrid system replaces a traditional hydraulic fan system with a slide-in, controllable electric fan package. The study concluded that the Mini-Hybrid Thermal System provided the following benefits:

- Reduced emissions resulting in contribution to greenhouse gas (GHG) reduction commitment of 9% per bus.
- A Return on Investment (ROI) of 5 years
- An annual per vehicle fuel reduction of 3,800 litres (approximately \$3,500 in cost)
- An annual per vehicle reduction in maintenance costs of approximately \$2,000.00

Past staff reports, including detailed information on the equipment technology and consequent purchases can be found on the following webpages:

- <http://www.halifax.ca/council/agendasc/documents/100112ca1111.pdf>
- <http://www.halifax.ca/council/agendasc/documents/100126ca10111.pdf>
- <http://www.halifax.ca/Council/agendasc/documents/101207ca1112.pdf>

Tender No. 13-128 for up to one-hundred (100) Mini Hybrid Thermal Systems was publically advertised on the Province of Nova Scotia website starting on July 15, 2013, and closed on August 1, 2013.

As an outcome of the Halifax Regional Council meeting held September 11, 2013 the Award of Tender No. 13-128, Mini-Hybrid Thermal Systems was approved and awarded to Cummins Eastern Canada for a total Tender Price of \$2,580,562.71 (net HST included). The project scope included funding to install Mini-Hybrid Thermal Systems on ninety-nine (99) buses over the course of a three year period.

DISCUSSION

To date, the Mini-Hybrid Thermal System has been installed on fifty (50) buses (5 of which were test buses and not part of Tender No. 13-128). Data was collected and analyzed for 27 of the 50 buses to measure the performance of the project. The results indicated the following:

- Reduced emissions resulting in contribution to greenhouse gas (GHG) reduction commitment of 8% per bus
- A Return on Investment (ROI) of 7.5 years
- An annual per vehicle fuel reduction of 3,067 litres (approximately \$3,000 in cost)
- An annual per vehicle reduction in maintenance costs of approximately \$668.00

The scope of the 13-128 was to install the Mini-Hybrid Systems on vehicles manufactured between 2005 and 2009, so ROI was achieved when the vehicle reached its Economic Replacement Point (ERP) of 18 years.

In the 2014/15 fiscal year, based on financial benefits, the Economic Replacement Point (ERP) for Halifax Transit buses was changed to (15) years. As a result, the service life of a bus will be reduced by three (3) years and buses manufactured between 2005 and 2007 will not reach the seven and one-half (7.5) year return on investment required for the Mini-Hybrid Thermal System Project. Please see the logic below for the cut-off point for the project.

Cut-off Point by vehicle year for Mini-Hybrid Thermal System Installations on 40' Conventional Buses:

Installation year: 2015 (after July)

Return on investment: 7.5 years

Return on Investment Point: 2023

Economic Replacement Point of bus: 15 years

Cut-off Point for Mini-Hybrid Thermal System Installation: 2023 – 15 years = 2008

Therefore, it is recommended to not install Mini-Hybrid Thermal Systems on buses manufactured prior to 2008 based on failure to produce sufficient return on investment.

FINANCIAL IMPLICATIONS

By removing buses manufactured between 2005 and 2007 from the scope of the project, only nineteen (19) buses remain to be retro-fitted with the new thermal system. Each installation costs \$26,066.00 (net HST included), rendering a total required amount of \$495,254.00 for the remaining installations on 2008/2009 buses; 2008 vehicles, because of the current 15 year ERP, are removed from the financials detailed below. There is no impact to the operating or project budget in 2015/16 as remaining project needs will come from account CM020006. Additionally, excess funds will be un-committed in Capital Surplus Reserve Q103, pending ratification from Council.

Funds to Reallocate from Project Account CM020006

Total Budget – Project Account CM020006	\$ 1,862,331.43
Less: Total Expenditures – Project Account CM020006	\$ 912,320.15
Less: Total Commitments – Project Account CM020006	\$ 52,132.57
Less: Remaining Installations with new ERP of 15 years (19 buses)	<u>\$ 495,254.00</u>
Reduction of Project Budget (funding from Q103 will be uncommitted)	\$ 402,624.71

COMMUNITY ENGAGEMENT

N/A

ENVIRONMENTAL IMPLICATIONS

The Mini-Hybrid Thermal Systems installed will continue to lower HRM corporate GHG emissions as per the Corporate GHG Emissions Reduction Plan. Fifty (50) Halifax Transit buses with Mini-Hybrid Thermal Systems have saved approximately 313,000 Litres of Diesel Fuel to date and it is expected that the remaining nineteen (19) buses will save another 3,067 Litres per bus per year. It is important to note that any new vehicles since 2013 have been outfitted with the EMP Mini-Hybrid Thermal System and the overall GHG Emissions of Halifax Transit's Fleet will reduce over time.

ALTERNATIVES

The Chair and Members of Audit & Finance Standing Committee may choose to continue the installation of all Mini-Hybrid Thermal Systems on the remaining Halifax Transit buses within the initial scope of the project (forty-three buses in total remaining). This option will result in a loss of approximately \$346,562.00 in non-recoverable funds if all buses are retired at fifteen (15) years in service. Also, the Chair and Members of Audit & Finance Standing Committee may choose to continue the installation of Mini-Hybrid Thermal Systems on only the fifteen buses budgeted for in Project Account CM020006, resulting in a loss of \$110,458.00.

ATTACHMENTS

Attachment 1 - Supporting Data – Fuel Savings Mini-Hybrid Thermal System

Attachment 2 - Fuel Comparative Data – Buses with EMP unit vs without EMP unit

Attachment 3 - Supporting Data – Maintenance Savings Mini-Hybrid Thermal System (Cost of Hydraulic Fan System)

A copy of this report can be obtained online at <http://www.halifax.ca/boardscom/SCfinance/index.php> then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 902.490.4210, or Fax 902.490.4208.

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Report Approved by:

Eddie Robar, Director, Halifax Transit, 902.490.6720

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Financial Approval by:

Amanda Whitewood, Director of Finance & ICT/CFO, 902.490.6308

EMP INSTALLED PRIOR TO CURRENT CONTRACT

LOCATION	UNIT #	Yr Installed	YRS W EMP	LITRE/KM					
				2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
BTC	1042	2010	5	0.635	0.675	0.549	0.759	0.879	0.583
RLTC	1131	2010	5	0.632	0.608	0.603	0.628	0.632	0.574
BTC	1031	2010	5	0.637	0.970	0.545	0.515	0.562	0.477
BTC	614	2010	5	0.570	0.537	0.543	0.497	0.496	0.492
BTC	1083	2010	5	0.645	0.554	0.567	0.541	0.537	0.532
BTC	1113	2011	4	0.620	0.638	0.580	0.566	0.590	0.592
BTC	1116	2011	4	0.678	0.630	0.599	0.598	0.546	0.541
BTC	1059	2011	4	0.600	0.644	0.648	0.454		0.543
BTC	1108	2011	4	0.647	0.643	0.590	0.375	0.533	0.554
BTC	1119	2011	4	0.664	0.635	0.586	0.626	0.583	0.583
BTC	1120	2011	4	0.639	0.640	0.591	0.612	0.607	0.633
BTC	1121	2011	4	0.737	0.654	0.603	0.611	0.600	0.576
BTC	1093	2011	4	0.615	0.620	0.550	0.530	0.557	0.538
BTC	1117	2012	3	0.659	0.665	0.616	0.555	0.589	0.573
BTC	1118	2012	3	0.667	0.664	0.627	0.590	0.540	0.536
BTC	1111	2012	3	0.677	0.667	0.608	0.584	0.597	0.574
BTC	615	2013	2	0.585	0.526	0.502	ERROR	0.365	0.477
BTC	616	2013	2	0.497	0.532	0.539	0.500	0.514	0.499
BTC	617	2013	2	0.603	0.545	0.606	0.797	0.499	0.514
BTC	618	2013	2	0.577	0.554	0.489	0.498	0.577	0.467
BTC	619	2013	2	0.582	0.454	ERROR	0.388	0.367	0.378

EMP INSTALLED UNDER CURRENT CONTRACT

LOCATION	UNIT#	INSTALLED	YEARS W EMP	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
BTC	1110	Jan-14	1.5	0.656	0.635	0.720	0.421	1.134	0.438
RLTC	1123	Feb-14	1.5	0.660	0.664	0.684	0.605	0.644	0.719
RLTC	1124	Feb-14	1.5	0.728	0.710	0.590	0.651	0.650	0.495
RLTC	1137	Mar-14	1.4	0.660	0.644	0.607	0.620	0.482	ERROR
BTC	1045	Mar-14	1.4	0.585	0.806	0.628	0.607	0.578	0.539
BTC	1109	Apr-14	1.3	0.661	0.656	0.621	0.620	0.732	0.760
RLTC	1125	09-Jun-14	1.1						
BTC	1060	03-Jul-14	1.0						
RLTC	1126	03-Jul-14	1.0						
RLTC	1130	8-Jul-14	1.0						
BTC	1096	23-Jul-14	1.0						
BTC	1053	19-Aug-14	0.9						
RLTC	1129	26-Aug-14	0.9						
RLTC	1153	10-Sep-14	0.9						
BTC	1104	19-Sep-14	0.8						
BTC	1065	11-Oct-14	0.8						
BTC	1097	24-Jan-15	0.5						
BTC	1055	25-Feb-15	0.4						
BTC	1018	13/04/2015	0.3						
BTC	1039	23-Apr-14	1.2						
BTC	1098	21-Jul-14	1.0						
BTC	1112	09-Sep-14	0.9						
RLTC	1132	01-Jul-14	1.0						
RLTC	1140	08-Jul-15	0.0						
RLTC	1142	30-Mar-15	0.3						
RLTC	1156	18-Mar-15	0.3						
BTC	1056	Jun-14	1.1						
BTC	1088	Apr-15	0.3						
RLTC	1122	Oct-14	0.79						

	BEST CASE	WORST CASE	AVG
BEFORE L/KM	0.62	0.58	0.60
AFTER L/KM	0.56	0.54	0.55
Per Bus Calculation			
AVG L/KM SAVED	0.06	0.04	0.048
AVG % SAVED	9%	7%	8.0%
AVG KM/YEAR	63,485	63,684	63,585
AVG SAVED LITRES/YR	3,550.25	2,583.69	3,067
\$ Savings per year:	\$ 3,337.24	\$ 2,428.67	\$ 2,883
Initial Investment	\$ 26,066.00	\$ 26,066.00	\$ 26,066
Maint. Savings/yr	\$ 668.08	\$ 668.08	\$ 668
Total Savings/yr	\$ 4,005.32	\$ 3,096.75	\$ 3,551
ROI	6.5	8.4	
AVERAGE ROI:	7		

KM per Litre Analysis 2014/2015

Attachment 2

Bus #	1-Apr-14	1-May-14	1-Jun-14	1-Jul-14	1-Aug-14	1-Sep-14	1-Oct-14	1-Nov-14	1-Dec-14	1-Jan-15	1-Feb-15	1-Mar-15	AVG bus with EMP	AVG bus w/o EMP
600	1.05		1.94	1.55	1.59	1.53	1.64	1.20		1.38	1.25	1.27		1.44
601	1.75	2.88	2.00	2.18	2.25	2.47	2.23	1.82	1.98	2.04	1.85	1.48		2.08
602	1.59	2.23	1.99	2.18	2.24	2.11	1.97	1.66	2.13	2.16	1.36	1.50		1.93
603	1.17	2.33	1.95	1.90	1.97	2.08	2.16	1.96	2.09	1.71	1.70	1.91		1.91
604	2.22	2.16	1.93	1.98	1.79	1.31	2.15	1.89	1.48	1.88	1.83	1.87		1.88
605	1.96	2.53	2.10	1.87	2.00	2.28	2.07	1.75	1.73	1.64	1.22			1.92
606	1.93	2.48	1.85	2.24	1.97	1.92	1.75	2.03	1.89	1.71	1.28	1.67		1.89
607	1.46		2.87	2.00	2.34	2.19	1.82	1.74	1.90	1.53	1.98			1.98
608	1.86	2.17			1.77	3.19	3.63	1.91	2.24	2.22	1.66	1.51		2.22
609	1.84	2.15	1.62	2.05	1.94	2.02	2.04		1.74	1.76	1.59	1.71		1.86
610	1.98	1.78	2.24	2.04	1.99	1.95			2.24	2.17	2.29	1.74		2.04
611	1.33	2.26	1.93	1.94	2.03	1.82	1.71	1.93	2.04	2.11	1.55	1.43		1.84
612	1.90		2.84	1.89	1.92	1.88	2.03	1.72	1.96	2.03	1.55	1.69		1.95
613	1.65	2.36		3.92			2.00	1.67	1.92	1.92	1.47	1.57		2.05
614	1.90	2.25	1.92	2.08	2.08	2.24	2.32	1.83	2.15	2.17	1.66	1.74	2.03	
615	1.62	2.28	1.91	2.10	2.18	2.09	2.41	2.07	2.64	2.05	1.33	1.89	2.05	
616	1.57	2.35	1.98	2.28	2.04		2.28	1.98	2.04	1.69	1.22	1.75	1.93	
617	2.22	1.96			2.07	1.99	2.16	2.11	1.95	1.87	1.73	1.74	1.98	
618	2.01	2.19	2.42	2.17	1.89	2.09	3.25	1.87			3.13	1.43	2.25	
619	1.99	2.92	2.94			3.22	2.19		2.22	2.36	2.28	1.60	2.41	
1033	1.74	2.21	1.81	1.41		1.61	1.71	1.59	1.43	1.50	1.35	1.74		1.64
1034	1.10	3.75	1.74	2.06	2.18	2.43	2.22	2.04	2.16	1.77	1.83			2.12
1035	1.38	2.35	1.91	1.88	1.98	1.30	3.99	1.72	1.75	1.65	2.00	1.15		1.92
1036	1.67	2.01	1.70	1.71	2.19	1.71	1.73	1.71	1.80	3.29				1.95
1037	2.29	1.74	1.84	2.19	1.52	2.06	2.03	1.94	1.86	1.65	1.38	1.99		1.87
1038	1.22	3.80	1.14	2.26	1.76	1.82	2.16	1.47	1.73	1.49	1.78	1.13		1.81
1039	1.91		2.45	2.08	2.09	1.76	1.61	1.27	2.06	2.01	1.57	1.31		1.79
1040	1.73	1.86	1.90	1.87	1.69	1.81	2.12	2.04	1.74	1.75	1.47	1.49		1.79
1041	1.63			2.10	1.73	1.76	2.06	1.78	1.87	2.04	1.26	1.91		1.81
1042	1.83	2.27	1.76	2.23	2.05	2.11	1.93		1.47		1.12	1.26	1.80	
1043	1.64	1.97	1.89	2.24	1.90	1.93	1.60	1.76	1.72	1.83	1.29	1.83		1.80
1044	1.51	2.69	1.79	1.75	1.68	1.46	1.37			1.41	1.43	2.00		1.71
1045	1.80	2.06	1.57	2.00	1.83	1.81	2.11	1.74	1.93	1.81	1.61	1.84	1.84	
1046	1.86	1.91	1.76	1.76	1.68	1.68	1.71	1.71	1.77	1.54	1.35	1.40		1.68
1047	1.58	2.20	1.81	2.02	1.86	1.91	1.93	1.67	1.50			1.62		1.81
1048	1.96	1.73	1.57	2.08	1.74	1.77	1.82	2.22	1.49			1.78		1.82
1049	1.85	1.60	1.49		2.18	1.87	1.71	1.73	1.67	1.78	1.33	1.59		1.71
1050	2.05	2.24	2.09	1.98	2.00	1.84	2.02	1.94	2.10	2.51	1.34	1.35		1.95
1051	1.39	1.83	1.34	1.39				1.13	1.58	1.58		1.63		1.48
1052	1.73	2.09	1.71	1.81	3.01	1.85	2.26	1.76	1.74	1.93				1.99
1053	1.17	1.84	1.47	1.54	2.57	1.79	2.29	1.76	2.10	1.82	1.87	1.05		
1054														
1055	1.86	2.25	1.93	1.84	1.68	1.84	1.92	1.65	2.05	1.95	1.45	1.88		
1056	1.16	1.49	2.09	1.11		1.82	1.59	0.00	2.85	2.15	1.50	1.55		
1057	1.72	1.09	1.67	1.31	2.06	1.94	1.46			2.28		1.25		1.64
1058	1.80	1.87	1.55	1.54	1.75	1.57	1.69	1.47	1.71		1.88	1.76		1.69
1059	1.86	2.20	1.30	2.21	1.72	1.76	1.75	1.74	1.99	1.79		2.02	1.85	
1060	1.35	2.20	1.90	1.60	1.93	1.63	1.90	1.96	1.83	1.82	1.26	1.75		
1061	1.00	1.23	1.29	2.55	1.67	1.44	1.83	1.60	1.54	1.77	1.73	1.44		1.59
1062	1.68	1.89	1.96	1.73	1.47	2.08	1.78	1.45	1.75	1.84		1.69		1.76
1063	1.57	1.90	1.79	2.10	1.80	1.54	2.00	1.83	1.66	1.64		1.79		1.78
1064	1.85	1.65	1.74	1.65				1.45	1.60	1.51	1.55	1.74		1.64
1065		1.01	1.79	1.70	1.64	1.72	1.85	1.91	1.57	1.77	1.63	1.55		
1066	1.09	1.62	1.19	1.62	1.47	1.42	1.38	1.24	1.44	1.60	1.85	1.53		1.45
1067	1.67			1.54	3.71	1.64	1.97	1.57	1.83	1.50	1.29	1.53		1.82
1068	1.55	1.60	1.58	1.67	1.51	1.56		1.41	1.48	1.49	1.74	1.20		1.53
1069		1.34					1.49	1.45	1.65	1.76	1.56	1.62		1.55
1070	1.86	1.82		1.89	1.85	1.75	1.92	1.52	1.88	2.07	1.49	1.65		1.79
1071	1.71	1.96	1.61	1.97	1.83	1.67	1.80	1.68	1.77	1.46	2.28	1.64		1.78
1072	1.72	1.68	1.79	2.02	2.26						1.93	1.43	1.57	1.80
1073	1.41	1.99	1.60	2.54	1.71	1.54	1.78	1.55	1.75	2.01	1.01	1.59		1.71
1074	1.34	1.66	1.58	1.83	1.87	1.91	1.79	1.65	1.54	1.79	1.40	1.84		1.68
1075	1.41	1.87	1.47	1.92	1.73	1.59	1.60	1.62	1.83	2.02	1.35	1.38		1.65
1076	1.81	1.74	1.88	1.61	1.63	1.50	1.63	1.51	1.84	1.69	1.29	1.06		1.60
1077	1.55	2.00	1.71	1.62	1.60	1.74	1.45			1.20	1.60	1.73		1.62
1078	1.57	1.70	1.67	1.77	1.62		1.81	1.60	1.55	1.44	1.54	1.51		1.62
1079	1.08	2.00	1.41	1.62	1.69	1.62	1.54		1.46	1.37	1.74	1.68		1.56
1080	1.96	1.93	1.54	1.51			1.80		2.04	1.32	1.71	1.54		1.70
1081	1.53	1.60	1.76	1.95	1.80	1.77	1.70	1.60	1.87	1.73	1.74	1.35		1.70
1082	1.46	1.87		1.60	1.81	1.51	1.95	1.77	1.79	1.61	1.33	1.62		1.67
1083	2.22	1.93	1.81	1.92	2.00	1.98	1.86	1.92	1.86	1.78	1.62	1.72	1.88	
1084		2.28	1.77	1.87	1.65	1.62	1.61	1.77	1.92	1.84	1.02	1.64		1.73
1085	1.67	1.62	1.68	1.76	2.11	1.59	1.96	1.66	1.65	1.80	1.35	2.05		1.74
1086	1.67	2.30	1.20	2.22	1.79	1.61	1.70	1.43	1.63	1.71	1.36	1.58		1.68
1087	1.15	1.51	1.01	1.36	1.42			1.34	1.81	1.46	1.80	1.65		1.45
1088	1.88	1.79	1.67	1.74	1.56	1.76	1.86	1.21	2.13	1.13	1.69			1.68
1089	1.56	2.12	1.76	2.49	1.28	1.73	1.73	1.71	1.75	1.40	1.52	1.70		1.73
1090	1.53	2.02	1.85	1.73	1.28		1.66	1.64	1.87	1.93	1.42	2.12		1.73
1091	1.49	1.99	1.49	1.88	1.77	1.71	1.80	1.62	1.96	1.99	1.41	1.69		1.73
1092	1.72	1.44	1.47	1.89	1.61	1.45	1.79	1.73	1.73	1.91	1.28	1.65		1.64

KM per Litre Analysis 2014/2015

Bus #	1-Apr-14	1-May-14	1-Jun-14	1-Jul-14	1-Aug-14	1-Sep-14	1-Oct-14	1-Nov-14	1-Dec-14	1-Jan-15	1-Feb-15	1-Mar-15	AVG bus with EMP	AVG bus w/o EMP
1093	1.97	2.20	1.88	1.88	1.74	1.70	1.94	1.73	1.97	1.85	1.49	2.00	1.86	
1094	1.76	1.84	1.71	1.76	1.67	1.70	1.88	1.66	1.62	1.69	1.84	1.63		1.73
1095	1.71	1.79	1.39	1.50	2.01	1.66	1.66	1.47	1.73	1.65	1.32	1.20		1.59
1096	1.45	1.83	1.15	1.95	1.66	1.70	1.89	1.77			1.47	2.10		
1097	1.54		2.13	1.48	1.58	1.73	1.72	1.32	1.71	1.47	2.29	1.86		
1098	1.45	2.47	1.35	2.33	1.98	1.89	1.70	1.80	1.86	1.70	1.85	1.61		
1099	1.53	2.11	1.61	1.69	1.58	1.60	1.80	1.69		2.13	1.38	1.59		1.70
1100	2.18	1.76	1.76	1.74	1.84	1.77	1.67	1.71	1.66	1.60	1.51	1.73		1.74
1101		2.07	1.63	1.84	1.82	1.63	2.24	1.77	1.79	1.65	1.55	1.30		1.75
1102	1.53	2.12	1.46	2.21			1.79	1.70	1.77	1.88	1.64	1.83		1.79
1103	1.11	2.03	1.68	1.89	1.73	1.63	1.86	1.52	1.87	1.64	1.62			1.69
1104	1.50	1.93	1.73	1.95	1.72	1.40	1.87	1.89	1.70	1.71	1.70	1.95		
1105	1.48	2.38	1.57	2.06	1.82	1.84	2.02	1.54	1.65	1.87	1.35	1.63		1.77
1106	1.73		1.51	1.68	1.69	1.51	1.76		1.91	1.63	1.36	1.26		1.60
1107	1.51	1.90	1.71	1.46	1.89	1.83	1.83	1.79	1.66	1.80	1.10	1.89		1.70
1108	1.72	2.04	1.65	1.84	1.96	1.75	2.47	1.40	1.86	1.62	1.68	1.42		1.78
1109	1.15	1.47	1.33	1.31	1.37	1.20	1.37		1.34	2.09	1.06			1.37
1110		1.05						1.52	1.71	1.91	1.35	2.03		1.60
1111	1.85	1.66	1.78	1.65	1.69	1.70	1.88	1.83	1.70	1.76	1.39	2.19		1.76
1112	1.58	1.85	1.63	1.56	1.54	1.60	1.66	1.67	1.43	2.16	1.31	1.76		
1113		1.87	1.62	1.84	1.76	1.46	1.78	1.66	2.06	1.43	1.81	1.23		1.68
1114	1.66	1.14	1.57	1.78	1.56	1.84	1.39	1.65	1.53	1.67	1.48	1.63		1.58
1115	1.32	2.20	1.51	1.81	1.60	1.63	1.61	1.19		1.26	2.61	1.17		1.63
1116	1.59	1.98	1.71	1.52	2.68	1.70	2.13	1.68	1.96	1.73	1.82	1.91		1.87
1117	1.61	2.01	1.83	1.64	1.75	1.80	1.61	1.59	1.67	1.59	1.76	1.88		1.73
1118	2.03	1.87	1.90	1.80	1.82	1.53	2.01	1.94	1.86	1.92	1.38	1.58		1.80
1119	1.79	1.67	1.58	1.93	1.59	1.79	1.95	1.66	1.87	1.52	1.63	1.46		1.70
1120	1.42	2.20	1.68	1.52	1.46	1.48	1.64	1.34	1.49	1.71	1.54	1.74		1.60
1121	1.36	2.25	1.77	2.81	1.63	1.66	1.72	1.75	1.65	1.55				1.81
1122	1.77	1.95	1.84	1.72	1.20	1.56	1.77	1.87	1.85	1.55	3.33	1.42		
1123	1.47	1.83	1.70	1.74	1.69	1.54	1.79	1.66	1.71	1.72	1.43	1.90		1.68
1124	1.54	2.93	1.57	1.76	1.71	1.75	1.76	1.84	3.71	1.49	1.76	1.66		1.96
1125	1.52	1.79	1.71	1.71	1.65	1.61	1.84	1.76	1.86	1.68	1.84	1.61		
1126	1.61	1.80	1.48	1.41		1.39	1.77	1.70	2.15	1.79	1.75	1.78		
1127	1.68	1.80	1.71	1.72	1.76	1.74	1.80	1.65	1.80	1.73	1.50	1.72		1.72
1128	1.36	1.90	1.63	1.79	1.68	1.58	1.61	1.82	1.96	1.63	1.37	1.63		1.66
1129	1.51	1.82	1.61	1.70	1.83	1.73	1.96	1.72	1.65			1.54		
1130	1.72	1.80	1.76	1.81	1.92	1.50	1.91	1.67	1.70	1.87	1.66	1.70		
1131	1.71	1.77	1.67	1.61	1.71	1.69	1.84	1.74	1.88	1.71	1.48	1.75		1.71
1132	1.52	3.67	1.82	1.67	1.74	1.63	1.83	1.80	1.64	1.82	1.64	1.73		
1133	1.36	1.65	1.50	1.58	1.55	1.43	1.54	1.43	1.72	1.45	1.57	1.44		1.52
1134	1.19	1.74	1.61	1.66	1.66	1.65	1.82	1.66	1.73	1.52	1.69	1.60		1.63
1135	1.55	1.12	1.69	1.52	1.62	1.47	1.67	2.03	1.65	1.62	1.64	1.70		1.61
1136	1.60	1.77	1.75	1.58	1.54	1.64	1.85	1.69		1.73	1.79	1.73		1.70
1137	1.43	2.22	2.06	1.73	1.94	1.72	1.90	1.80	1.93	1.70	1.65	1.79		1.82
1138	1.60	1.92	1.72	1.68	1.66	1.65	1.71	1.79	1.50	1.80	1.73	1.59		1.70
1139	1.59	1.82	1.47	1.77	1.60	1.55	1.50	1.47	1.78	1.56	1.40	1.44		1.58
1140	1.27	3.42	1.41	1.97	1.84	1.68	1.75	1.71	1.89	1.81	1.74	1.72		
1141	1.40	1.72	1.51	1.56	1.61	1.57		1.35	1.56	1.49	1.42			1.52
1142	1.37	1.95	1.57	1.85	1.63	1.48	1.71	1.70	1.82	1.64	1.70	1.53		
1143	1.65	1.74	1.86	1.63	1.63	1.49	1.76	1.58	1.84	1.62	1.79	1.68		1.69
1144	1.46	1.61	1.68	1.60	1.62	1.54	1.73	1.58	1.67	1.59	1.40	1.75		1.60
1145	1.43	1.80	1.55	1.78	1.67	1.62	1.88	1.56	1.81	1.82	1.48	1.56		1.66
1146	1.56	1.92	1.83	1.64	1.63	1.56	1.81	1.56	1.88	1.48				1.69
1147	1.59	1.86	1.73	1.56	1.65	1.67	1.69	1.80	1.95	1.87	1.66	1.71		1.73
1148	1.52	1.86	1.47	1.79	1.71	1.65	1.70	1.75	1.82	1.64	1.14	1.62		1.64
1149	1.60	1.87	1.75	1.44	1.67	1.62	1.72	1.74	1.71	1.70	1.55	1.69		1.67
1150	1.49	1.96	1.44	1.89	1.55	1.57	1.69	1.53	1.63	1.70	1.58	1.35		1.62
1151	1.55	1.88	1.72	1.73	1.67	1.64	1.77	1.66	1.75	1.70	1.76	1.73		1.71
1152	1.36	1.58	1.45	1.52	1.33	1.22	1.53	1.30	1.49	1.55	1.26	1.43		1.42
1153	1.63	2.02	1.68	1.83	1.70	1.61	1.89	1.84	1.48	1.73	1.79	1.76		
1154	1.30	1.80	1.54	1.43	1.41	1.37	1.55	1.40	1.45	1.53	1.23	1.75		1.48
1155	1.42	1.68	1.59	1.50	1.46	1.55	1.69	1.40	1.33	1.75	1.90	1.48		1.56
1156	1.44	1.62	1.56	1.19	1.66	1.13	1.66	1.30	1.93	1.50	1.44	1.39		
1157	1.54	1.81	1.65	1.71	1.55	1.57	1.60	1.55	2.00	1.40	1.43	1.61		1.62
1158	1.57	1.91	1.72	1.71	1.69	1.72	1.28	1.64	1.90	1.74	1.53	1.63		1.67
1159	1.57	2.07	1.40	1.57	2.00	1.61	1.72	1.61	1.78	1.63	1.32	2.15		1.70
1160	1.62	2.21	1.92	1.77	1.76	1.62	1.77	1.72	1.88	1.60	1.59	1.76		1.77
1161	1.87	2.08	1.89	1.70	1.72	1.72	1.80	1.76	1.79	1.78	1.59	1.75		1.79

AVG KM/L:	1.85	1.72
AVG L/KM:	0.54	0.58
SAVED L/KM:	0.04	

Attachment 3

Order	Description	Bas. start date	Created on	Actual release	System status	Total act.costs	Maint&Activty	MaintenancePlan	Entered by
1111	45133222 45000 Km Hydraulic Fan Filter	27/11/2009	19/11/2009	10/12/2009	CLSD PRT	118.14 002	17283	IP1020091119	ZWICKED
1111	40678770 MDR HYD FAN RUNNING	18/07/2010	10/06/2010	10/06/2010	CLSD PCNF PRT	56.99 003	17283	IP1020100713	ZWICKED
1111	45144123 45000 Km Hydraulic Fan Filter	07/10/2010	13/07/2010	07/10/2010	CLSD PCNF PRT	56.99 002	17283	IP1020100713	ZWICKED
1111	40701567 DDR HYD LEAK	07/10/2010	07/10/2010	07/05/2011	CLSD PRT	181.59 003	17283	GOODIEE	GOODIEE
1111	45159690 45000 Km Hydraulic Fan Filter	23/05/2011	12/05/2011	17/05/2011	CLSD PRT	110.64 002	17283	TERRIOM	TERRIOM
1111	40777739 URB MAINT isolate hyd lines, located be	27/10/2011	27/10/2011	27/10/2011	CLSD PCNF PRT	25.00 003	17283	IP102010512	GOODIEE
1111	45127688 45000 Km Hydraulic Fan Filter	17/11/2011	17/11/2011	17/11/2011	CLSD PCNF PRT	50.00 003	17371	IP1020120105	TERRIOM
1117	40596094 DDR ENG FAN LIGHT ON	19/01/2012	05/01/2012	09/01/2012	CLSD PCNF PRT	108.70 002	17371	IP1020091022	GALLANB
1117	40643726 TRR REPAIR FOR HYDRAULIC LEAKS	30/10/2009	22/10/2009	07/04/2009	CLSD PCNF PRT	200.00 003	17371	IP1020091022	MCROBERR
1117	40643978 DDR Engine fan fault	15/12/2009	15/12/2009	05/11/2009	CLSD PRT	75.00 003	17385	GOLDSMD	GOLDSMD
1117	40670026 URB MAINT repair leak at hyd tank	15/12/2009	15/12/2009	15/12/2009	CLSD PCNF PRT	95.46 003	17371	TERRIOM	TERRIOM
1117	45142917 45000 Km Hydraulic Fan Filter	23/04/2010	23/04/2010	23/04/2010	CLSD PCNF PRT	83.56 002	17371	IP1020100610	IP1020100610
1117	45158124 45000 Km Hydraulic Fan Filter	14/06/2010	10/06/2010	08/09/2010	CLSD PCNF PRT	71.43 002	17371	IP1020110411	IP1020110411
1117	45169942 45000 Km Hydraulic Fan Filter	23/04/2011	11/04/2011	30/11/2011	CLSD PRT	94.23 002	17371	IP1020111110	IP1020111110
1118	40792209 MDR HYD FAN OIL BLACK	05/05/2009	29/04/2009	04/01/2012	CLSD PCNF PRT	69.19 003	17385	MORRISR	MORRISR
1118	45123794 45000 Km Hydraulic Fan Filter	05/05/2009	29/04/2009	02/05/2009	CLSD PCNF PRT	60.85 002	17385	IP1020090429	ZWICKED
1118	40637144 HLD HYD FAN RUNNING ALL THE TIME	15/11/2008	15/11/2009	15/11/2009	CLSD PCNF PRT	57.06 002	17385	IP1020091204	GALLANB
1118	45133845 45000 Km Hydraulic Fan Filter	14/12/2009	04/12/2009	30/12/2009	CLSD PCNF PRT	118.99 002	17385	GALLANB	GALLANB
1118	45137360 45000 Km Hydraulic Fan Filter	17/09/2010	11/02/2010	11/02/2010	CLSD PCNF PRT	32.05 003	17385	GOODIEE	GOODIEE
1118	40678951 DDR CK FAN HOUSING	10/06/2010	10/06/2010	10/06/2010	CLSD PCNF PRT	677.42 003	17385	GOODIEE	GOODIEE
1118	40717153 MDR FAN LIGHT ON	17/12/2010	11/08/2010	11/08/2010	CLSD PCNF PRT	56.50 003	17385	GOLDSMD	GOLDSMD
1118	40744114 DDR repair dash fans	25/04/2011	25/04/2011	01/05/2011	CLSD PCNF PRT	93.61 003	17385	IP102010714	IP102010714
1118	40745149 DDR Fan fault light on	23/07/2011	14/07/2011	05/08/2011	CLSD PCNF PRT	102.24 002	17385	GOLDSMD	GOLDSMD
1118	45162734 45000 Km Hydraulic Fan Filter	05/08/2011	05/08/2011	10/08/2011	CLSD PCNF PRT	433.82 003	14089	IP1020090409	IP1020090409
1118	40762189 DDR Repair hyd. oil leak	16/04/2009	09/04/2009	04/01/2012	CLSD PRT	146.47 002	14089	DORRYC	DORRYC
615	45122957 45000 Km HYDRAULIC FAN FILTER	23/07/2010	23/07/2010	23/07/2010	CLSD PCNF PRT	25.00 002	14089	IP1020100204	IP1020100204
615	45137127 45000 Km Hydraulic Fan Filter	08/11/2010	28/10/2010	09/11/2010	CLSD PCNF PRT	521.74 003	14089	ZWICKED	ZWICKED
615	45167882 45000 Km Hydraulic Fan Filter	15/02/2011	15/02/2011	15/02/2011	CLSD PCNF PRT	877.68 003	14089	WALTERM	WALTERM
616	45129292 45000 Km Hydraulic Fan Filter	11/10/2011	06/10/2011	28/10/2011	CLSD PCNF PRT	100.00 003	14089	IP1020111006	IP1020111006
616	45140949 45000 Km Hydraulic Fan Filter	24/08/2009	13/08/2009	26/08/2009	CLSD PCNF PRT	58.61 002	14093	IP1020090813	IP1020090813
616	40690441 URB MAINT Hydraulic line leaking und	21/09/2010	21/09/2010	21/09/2010	CLSD PCNF PRT	65.36 002	14093	IP1020100422	IP1020100422
616	45153571 45000 Km Hydraulic Fan Filter	07/01/2011	06/01/2011	25/01/2011	CLSD PCNF PRT	136.16 003	14093	TURPLEE	TURPLEE
616	40769707 MDR REPAIR ENG FAN	20/09/2011	20/09/2011	20/09/2011	CLSD PCNF PRT	60.70 002	14093	ZWICKED	ZWICKED
616	45171630 45000 Km Hydraulic Fan Filter	29/12/2011	15/12/2011	21/12/2011	CLSD PCNF PRT	552.66 003	14093	IP1020110106	IP1020110106
617	4062706 MDR CK HYDRAULIC RESOIVOIR FULL	11/05/2009	11/05/2009	20/07/2009	CLSD PRT	86.26 002	14093	IP1020111215	IP1020111215
617	45127284 45000 Km HYDRAULIC FAN FILTER	28/06/2009	25/06/2009	11/05/2009	CLSD PCNF PRT	37.50 003	14097	BHATHES	BHATHES
617	45140333 45000 Km Hydraulic Fan Filter	27/04/2010	15/04/2010	29/04/2010	CLSD PCNF PRT	237.89 002	14097	IP1020090625	IP1020090625
617	40681544 DDR REPAIR HYDRAULIC LEAK	23/06/2010	23/06/2010	24/06/2010	CLSD PCNF PRT	1,243.58 003	14097	IP1020100415	IP1020100415
617	40681638 TRR BLOWN HYD LINE	24/06/2010	24/06/2010	09/11/2010	CLSD PCNF PRT	25.00 003	14097	MICROBERR	MICROBERR
617	40708401 MDR Repair engine fan	09/11/2010	09/11/2010	15/02/2011	CLSD PCNF PRT	855.25 003	14097	GOLDSMD	GOLDSMD
617	45154220 45000 Km Hydraulic Fan Filter	02/02/2011	30/01/2011	23/08/2011	CLSD PCNF PRT	73.43 002	14097	IP1020110120	IP1020110120
617	40765237 DDR REPAIR HYD LEAK	23/08/2011	24/08/2011	24/08/2011	CLSD PCNF PRT	133.40 003	14097	GULLIVT	GULLIVT
617	40765302 TRR Hyd oil leak	05/06/2009	21/05/2009	24/06/2009	CLSD PRT	50.00 003	14097	BRIGLEA	BRIGLEA
618	45124602 45000 Km HYDRAULIC FAN FILTER	04/03/2010	11/03/2010	22/03/2010	CLSD PCNF PRT	58.61 002	14101	IP1020090521	IP1020090521
618	45138811 45000 Km Hydraulic Fan Filter	19/12/2010	06/12/2010	06/12/2011	CLSD PCNF PRT	70.85 002	14101	IP1020100311	IP1020100311
618	40714204 MDR FAN RUNNING ALL THE TIME	19/09/2011	19/09/2011	19/09/2011	CLSD PCNF PRT	776.16 003	14101	WALTERM	WALTERM
618	45152384 45000 Km Hydraulic Fan Filter	14/11/2011	03/11/2011	15/11/2011	CLSD PCNF PRT	73.20 002	14101	IP1020101209	IP1020101209
618	45169704 45000 Km Hydraulic Fan Filter	06/12/2011	06/12/2011	06/12/2011	CLSD PCNF PRT	50.00 003	14101	GALLANB	GALLANB
618	40786510 URB MAINT Repair hydraulic leak @ eng fl	15/05/2009	07/05/2009	23/08/2011	CLSD PCNF PRT	61.26 002	14101	IP1020111103	IP1020111103
619	45124775 45000 Km HYDRAULIC FAN FILTER	15/06/2009	15/06/2009	15/06/2009	CLSD PRT	1,760.61 003	14105	TERRIOM	TERRIOM
619	40609090 OSS SUPPLY HYD COMPONENTS TO CUMMINS	07/04/2010	25/03/2010	16/06/2010	CLSD PCNF PRT	69.40 002	14105	IP1020090507	IP1020090507
619	45139546 45000 Km Hydraulic Fan Filter	16/06/2010	16/06/2010	16/06/2010	CLSD PCNF PRT	1,364.82 003	14105	IP1020100375	IP1020100375
619	40679943 URB Maint Rep leak at fluid fan motor	28/10/2010	28/10/2010	17/11/2010	CLSD PCNF PRT	76.34 002	14105	BRIGLEA	BRIGLEA
619	45150187 45000 Km Hydraulic Fan Filter	13/12/2010	13/12/2010	13/12/2010	CLSD PCNF PRT	1,391.93 003	14105	IP1020101028	IP1020101028
619	40716026 URB MAINT Secure hydraulic lines by/r	23/06/2011	23/06/2011	06/07/2011	CLSD PCNF PRT	116.30 002	14105	TURPLEE	TURPLEE
619	45161716 45000 Km Hydraulic Fan Filter	28/06/2011	28/06/2011	28/06/2011	CLSD PCNF PRT	604.69 003	14105	IP102010623	IP102010623
619	40755522 MDR REPAIR HYD FAN	14/01/2012	05/01/2012	18/01/2012	CLSD PCNF PRT	755.04 003	14105	ZWICKED	ZWICKED
619	45172766 45000 Km Hydraulic Fan Filter	14/01/2012	05/01/2012	18/01/2012	CLSD PCNF PRT	61.27 002	14105	IP1020120105	IP1020120105
						\$ 16,034	TOTAL SAMPLE		
						\$ 5,345	TOTAL PER YEAR SAMPLE		
						\$ 668	TOTAL PER YEAR PER BUS		