Council Meeting

Council Chamber
Municipal Building - Jubilee Centre
9909 Franklin Avenue, Fort McMurray

Tuesday, April 8, 2008
6:00 p.m.

Agenda

Call to Order

Opening Prayer

Adoption of Agenda

Minutes of Previous Meetings

A. Regular Meeting – March 25, 2008

Delegations

None Scheduled.

Those individuals in attendance at the meeting will be provided with an opportunity to address Council regarding an item on the agenda, with the exception of those items for which a Public Hearing is required or has been held. Consistent with all delegations, each presentation will be allowed a maximum of five minutes.

Bylaws

A. Engineering Debenture Borrowing Bylaws *(two Bylaws for 1st reading)*

Reports

A. Regional Solid Waste Master Plan
B. Snye Channel Rehabilitation Project

New and Unfinished Business

Updates

A. Reporting of Councillors on Boards and Committees
(Councillors Clarkson, Allen, Blair, Byron)
B. Mayor's Update

Adjournment

REGIONAL MUNICIPALITY OF WOOD BUFFALO
COUNCIL REPORT

To:	Mayor and Council
From:	Engineering
Date:	April 8, 2008
Subject:	Debenture Borrowing for 2008 Engineering Capital Projects - Bylaw No. 08/027 - Lower Townsite West Loop Road - Bylaw No. 08/028 - Highway 63 Collector – Distributor Road Development Impacts

ISSUE:

Approval of debenture borrowing is required in order to proceed with projects previously approved through the Capital Budget process.

REFERENCE:

1. Municipal Government Act Section 251(1)
2. 2008 Capital Budget

HISTORY:

The following projects were approved by Council in the 2008 Capital Budget and identified debenture borrowing as a source of funding:

Bylaw #	Project Name	Funding Sources	Description
08/027	Lower Townsite West Loop Road	Provincial Grant: $17,258,132 Approved Reserve: $7,344,984 Debenture: $25,596,884 Total Cost - $50,200,000	Extension of the Lower Townsite (LTS) East Loop Road (Clearwater Drive) from Alberta Drive to Morrison Street. Preliminary alignment to be determined in Stage 1 of the Transportation Master Plan. Requires land acquisition on both sides of Riedel Street and relocation of portions of the Edge Water Court development. Provides a corridor for the extension of the Lift Station 1B 750mm sanitary sewer forcemain, Lift Station 1A replacement 750mm sanitary sewer forcemain and LTS 900mm watermain loop. (Sewer force main & water main budgeted under separate submissions)

Bylaw #	Project Name	Funding Sources	Description
08/028	Highway 63 Collector – Distributor Road Development Impacts	Provincial Grant: $34,800,000 Approved Reserve: $68,200,000 Debenture: $7,000,000 Total Cost - $110,000,000	Alberta Infrastructure and Transportation has developed a Collector – Distributor roadway concept for the upgrading of Highway 63 through the Lower Townsite. The Collector - Distributor road will impact a number of facilities and utilities which must be either modified, replaced or relocated, e.g., modify Fire Hall No.1 site, relocate King Street booster pump house, remove trunk watermain along highway to a new alternate alignment, replace LTS reservoir feed lines/ control valves. Immediate impacts include the utilities crossing on the Steinhauer bridge and their approaches, e.g., replacing the 600mm trunk water main from Richard Street to the new bridge from the Highway corridor onto Franklin Avenue.

ANALYSIS:

The 2008 Capital Budget was approved on December 10, 2007 and identified debenture borrowing as a source of funding for the above-noted projects.

These bylaws are brought forward for Council consideration as the Municipal Government Act requires Council approval of any borrowing. Debenture funds are drawn down by the Municipality upon conclusion of the project or whenever significant costs have been incurred. No borrowing costs are incurred if the project is delayed or does not proceed.

As all the projects exceed five (5) years in duration, advertising is required in accordance with Section 251 of the Municipal Government Act.

ATTACHMENTS:

1. Bylaw No. 08/027 w/amortization schedule
2. Bylaw No. 08/028 w/amortization schedule

ADMINISTRATIVE RECOMMENDATIONS:

THAT the following debenture borrowing bylaws be read a first time:

- Bylaw No. 08/027 - Lower Townsite West Loop Road
- Bylaw No. 08/028 - Highway 63 Collector – Distributor Road Development Impacts

BYLAW NO. 08/027

BEING A BYLAW OF THE REGIONAL MUNICIPALITY OF WOOD BUFFALO TO AUTHORIZE THE COUNCIL OF THE REGIONAL MUNICIPALITY OF WOOD BUFFALO TO INCUR AN INDEBTEDNESS BY THE ISSUANCE OF DEBENTURES IN THE AMOUNT OF TWENTY FIVE MILLION FIVE HUNDRED NINETY SIX THOUSAND EIGHT HUNDRED EIGHTY FOUR DOLLARS ($25,596,884.00) FOR THE PURPOSE OF THE LOWER TOWNSITE WEST LOOP ROAD.

WHEREAS the Council of the Regional Municipality of Wood Buffalo has decided to issue a bylaw pursuant to Section 258 of the Municipal Government Act to authorize the financing, undertaking and completion of the Lower Townsite West Loop Road;

WHEREAS the Regional Municipality of Wood Buffalo has made plans, specifications and estimates for the project and confirms the total cost of the Lower Townsite West Loop Road is $50,200,000.00.

WHEREAS in order to complete the said project, it will be necessary for the Regional Municipality of Wood Buffalo to borrow the sum of $25,596,884.00, for a period not to exceed twenty (20) years, from the Alberta Capital Finance Authority or another authorized financial institution, by the issuance of debentures and on the terms and conditions referred in this bylaw.

WHEREAS the principal amount of the outstanding debt of the Regional Municipality of Wood Buffalo at December 31, 2006 is $201,896,286.00 and no part of the principal or interest is in arrears;

WHEREAS the estimated lifetime of the project financed under this bylaw is equal to, or in excess of twenty (20) years;

AND WHEREAS all required approvals for the project have been obtained and the project is in compliance with all Acts and Regulations of the Province of Alberta;

NOW, THEREFORE, the Council of the Regional Municipality of Wood Buffalo, duly assembled, hereby enacts as follows:

1. That for the purpose of the Lower Townsite West Loop Road the sum of TWENTY FIVE MILLION FIVE HUNDRED NINETY SIX THOUSAND EIGHT HUNDRED EIGHTY FOUR DOLLARS ($25,596,884.00) be borrowed from the Alberta Capital Finance Authority or another authorized financial institution by way of debenture on the credit and security of the Regional Municipality of Wood Buffalo at large, of which amount the full sum of $25,596,884.00 is to be paid by the Regional Municipality of Wood Buffalo at large.

2. The proper officers of the Municipality are hereby authorized to issue debentures on behalf of the Municipality for the amount and purpose as authorized by this bylaw, namely the Lower Townsite West Loop Road.

3. The Municipality shall repay the indebtedness according to the repayment structure in effect, namely semi-annual or annual equal payments of combined principal and interest installments not to exceed twenty (20) years calculated at a rate not exceeding the interest rate fixed by the Alberta Capital Finance Authority or another authorized financial institution on the date of the borrowing, and not to exceed fourteen (14) percent.

4. The Municipality shall levy and raise in each year municipal taxes sufficient to pay the indebtedness.

5. The indebtedness shall be contracted on the credit and security of the Municipality.

6. The net amount borrowed under the bylaw shall be applied only to the project specified by this bylaw.

7. This bylaw shall become effective when it has received third reading and been signed by the Mayor and Chief Legislative Officer.

READ a first time this _____ day of _____, 2008.

READ a second time this _____ day of _____, 2008.

READ a third and final time this _____ day of _____, 2008.

SIGNED and PASSED this _____ day of _____, 2008.

CERTIFIED A TRUE COPY

_____
MAYOR

_____
CHIEF LEGISLATIVE OFFICER

_____
CHIEF LEGISLATIVE OFFICER

Debenture Schedule

Lower Townsite West Loop Road

Principal	$25,596,884.00
Interest	6.00%
Term	20
Payments	$2,231,652.99

Year	Beginning Balance	Interest	Payment	Principal	End Balance
					$25,596,884.00
1	$25,596,884.00	$1,535,813.04	$2,231,652.99	$695,839.95	$24,901,044.05
2	$24,901,044.05	$1,494,062.64	$2,231,652.99	$737,590.35	$24,163,453.70
3	$24,163,453.70	$1,449,807.22	$2,231,652.99	$781,845.77	$23,381,607.93
4	$23,381,607.93	$1,402,896.48	$2,231,652.99	$828,756.52	$22,552,851.41
5	$22,552,851.41	$1,353,171.08	$2,231,652.99	$878,481.91	$21,674,369.51
6	$21,674,369.51	$1,300,462.17	$2,231,652.99	$931,190.82	$20,743,178.69
7	$20,743,178.69	$1,244,590.72	$2,231,652.99	$987,062.27	$19,756,116.42
8	$19,756,116.42	$1,185,366.98	$2,231,652.99	$1,046,286.01	$18,709,830.41
9	$18,709,830.41	$1,122,589.82	$2,231,652.99	$1,109,063.17	$17,600,767.24
10	$17,600,767.24	$1,056,046.03	$2,231,652.99	$1,175,606.96	$16,425,160.29
11	$16,425,160.29	$985,509.62	$2,231,652.99	$1,246,143.37	$15,179,016.91
12	$15,179,016.91	$910,741.01	$2,231,652.99	$1,320,911.98	$13,858,104.94
13	$13,858,104.94	$831,486.30	$2,231,652.99	$1,400,166.70	$12,457,938.24
14	$12,457,938.24	$747,476.29	$2,231,652.99	$1,484,176.70	$10,973,761.54
15	$10,973,761.54	$658,425.69	$2,231,652.99	$1,573,227.30	$9,400,534.24
16	$9,400,534.24	$564,032.05	$2,231,652.99	$1,667,620.94	$7,732,913.31
17	$7,732,913.31	$463,974.80	$2,231,652.99	$1,767,678.19	$5,965,235.11
18	$5,965,235.11	$357,914.11	$2,231,652.99	$1,873,738.88	$4,091,496.23
19	$4,091,496.23	$245,489.77	$2,231,652.99	$1,986,163.22	$2,105,333.01
20	$2,105,333.01	$126,319.98	$2,231,652.99	$2,105,333.01	$0.00

	Interest	Payment	Principal
Total	$19,036,175.83	$44,633,059.83	$25,596,884.00

BYLAW NO. 08/028

BEING A BYLAW OF THE REGIONAL MUNICIPALITY OF WOOD BUFFALO TO AUTHORIZE THE COUNCIL OF THE REGIONAL MUNICIPALITY OF WOOD BUFFALO TO INCUR AN INDEBTEDNESS BY THE ISSUANCE OF DEBENTURES IN THE AMOUNT OF SEVEN MILLION DOLLARS ($7,000,00.00) FOR THE PURPOSE OF THE HIGHWAY 63 COLLECTOR-DISTRIBUTOR ROAD DEVELPOMENT IMPACTS.

WHEREAS the Council of the Regional Municipality of Wood Buffalo has decided to issue a bylaw pursuant to Section 258 of the Municipal Government Act to authorize the financing, undertaking and completion of the Highway 63 Collector-Distributor Road Development Impacts;

WHEREAS the Regional Municipality of Wood Buffalo has made plans, specifications and estimates for the project and confirms the total cost of the Highway 63 Collector-Distributor Road Development Impacts is $110,000,000.00.

WHEREAS in order to complete the said project, it will be necessary for the Regional Municipality of Wood Buffalo to borrow the sum of $7,000,000.00, for a period not to exceed fifteen (15) years, from the Alberta Capital Finance Authority or another authorized financial institution, by the issuance of debentures and on the terms and conditions referred in this bylaw.

WHEREAS the principal amount of the outstanding debt of the Regional Municipality of Wood Buffalo at December 31, 2006 is $201,896,286.00 and no part of the principal or interest is in arrears;

WHEREAS the estimated lifetime of the project financed under this bylaw is equal to, or in excess of fifteen (15) years;

AND WHEREAS all required approvals for the project have been obtained and the project is in compliance with all Acts and Regulations of the Province of Alberta;

NOW, THEREFORE, the Council of the Regional Municipality of Wood Buffalo, duly assembled, hereby enacts as follows:

1. That for the purpose of the Highway 63 Collector-Distributor Road Development Impacts the sum of SEVEN MILLION DOLLARS ($7,000,000.00) be borrowed from the Alberta Capital Finance Authority or another authorized financial institution by way of debenture on the credit and security of the Regional Municipality of Wood Buffalo at large, of which amount the full sum of $7,000,000.00 is to be paid by the Regional Municipality of Wood Buffalo at large.

2. The proper officers of the Municipality are hereby authorized to issue debentures on behalf of the Municipality for the amount and purpose as authorized by this bylaw, namely the Highway 63 Collector-Distributor Road Development Impacts.

3. The Municipality shall repay the indebtedness according to the repayment structure in effect,

namely semi-annual or annual equal payments of combined principal and interest installments not to exceed fifteen (15) years calculated at a rate not exceeding the interest rate fixed by the Alberta Capital Finance Authority or another authorized financial institution on the date of the borrowing, and not to exceed fourteen (14) percent.

4. The Municipality shall levy and raise in each year municipal taxes sufficient to pay the indebtedness.

5. The indebtedness shall be contracted on the credit and security of the Municipality.

6. The net amount borrowed under the bylaw shall be applied only to the project specified by this bylaw.

7. This bylaw shall become effective when it has received third reading and been signed by the Mayor and Chief Legislative Officer.

READ a first time this _____ day of _____, 2008.

READ a second time this _____ day of _____, 2008.

READ a third and final time this _____ day of _____, 2008.

SIGNED and PASSED this _____ day of _____, 2008.

CERTIFIED A TRUE COPY

_____
MAYOR

_____
CHIEF LEGISLATIVE OFFICER

_____
CHIEF LEGISLATIVE OFFICER

Debenture Schedule

Highway 63 Collector-Distributor Road Development Impacts

Principal	$7,000,000.00
Interest	6.00%
Term	15
Payments	$720,739.35

Year	Beginning Balance	Interest	Payment	Principal	End Balance
					$7,000,000.00
1	$7,000,000.00	$420,000.00	$720,739.35	$300,739.35	$6,699,260.65
2	$6,699,260.65	$401,955.64	$720,739.35	$318,783.71	$6,380,476.94
3	$6,380,476.94	$382,828.62	$720,739.35	$337,910.73	$6,042,566.21
4	$6,042,566.21	$362,553.97	$720,739.35	$358,185.37	$5,684,380.84
5	$5,684,380.84	$341,062.85	$720,739.35	$379,676.50	$5,304,704.34
6	$5,304,704.34	$318,282.26	$720,739.35	$402,457.09	$4,902,247.25
7	$4,902,247.25	$294,134.84	$720,739.35	$426,604.51	$4,475,642.74
8	$4,475,642.74	$268,538.56	$720,739.35	$452,200.78	$4,023,441.96
9	$4,023,441.96	$241,406.52	$720,739.35	$479,332.83	$3,544,109.13
10	$3,544,109.13	$212,646.55	$720,739.35	$508,092.80	$3,036,016.33
11	$3,036,016.33	$182,160.98	$720,739.35	$538,578.37	$2,497,437.96
12	$2,497,437.96	$149,846.28	$720,739.35	$570,893.07	$1,926,544.89
13	$1,926,544.89	$115,592.69	$720,739.35	$605,146.65	$1,321,398.23
14	$1,321,398.23	$79,283.89	$720,739.35	$641,455.45	$679,942.78
15	$679,942.78	$40,796.57	$720,739.35	$679,942.78	$0.00

	Interest	Payment	Principal
Total	$3,811,090.22	$10,811,090.22	$7,000,000.00

REGIONAL MUNICIPALITY OF WOOD BUFFALO
COUNCIL REPORT

To:	Council
From:	Public Works
Date:	April 8, 2008
Subject:	Regional Solid Waste Management Master Plan

ISSUE:

A Regional Solid Waste Management Master Plan is required to guide planning, budgeting and operation of solid waste services for the next 25 years.

REFERENCE:

- Regional Infrastructure Plan - Regional Municipality of Wood Buffalo, prepared by G. Pitman Consulting Inc.
- Alberta Environment - Alberta's Municipal Waste Action Plan. 2004
- Waste Stream Reduction Options/Implementation Feasibility Study, 2004– EBA Engineering Consultants Ltd.
- The DAGNY Partnership - Recycling Education and Awareness, Social Marketing Strategy, 2005-2008 - Regional Municipality of Wood Buffalo and Suncor"
- Banister Research and Consulting, "Regional Municipality of Wood Buffalo 2006 Recycling Baseline Study Report"
- Regional Municipality of Wood Buffalo Census 2006
- Bylaw No. 07/068 - Utility Rates Bylaw

HISTORY:

In 2007, The Regional Municipality of Wood Buffalo (RMWB) retained Golder Associates Ltd. to provide the RMWB with a Regional Solid Waste Management Master Plan to assist staff and council in making decisions on future waste programs for the Municipality. The primary objectives of the study were:

- Review waste characteristics and make projections for the short and long term future;
- Evaluate collection and disposal practices;
- Examine current environmental initiatives within the residential, commercial and industrial sectors and determine the baseline waste diversion potential;
- Provide a synopsis of best practices in solid waste management in similar size municipalities;
- Review and assess existing and alternative business models;
- Perform stakeholder outreach to interface with council, senior management and major industry;

- Assess the condition and operating capacity of the major solid waste management facilities within the RMWB and immediate surrounding areas including landfills, transfer stations, and recycling depots:
- Assess the fleet requirements for solid waste including maintenance facilities and vehicle replacement programs;
- Develop strategies to reduce waste and maximize operational efficiency and;
- Explore potential synergies between RMWB and private industry.

OPTIONS:

1. Adopt the Regional Solid Waste Management Master Plan to guide future solid waste management programs from 2008 to 2012.
2. Maintain Status Quo.

ANALYSIS:

The Regional Solid Waste Management Master Plan will be the corporate document used to guide all departments for business planning, including planning community growth, recycling programs, operation planning, and rural service delivery standards. The document is a holistic approach to creating a green community with waste diversion programs to meet and exceed environmental standards. The Regional Solid Waste Management Master Plan will be the guiding corporate document used when applying for any and all Provincial and Federal grant funding.

The Regional Solid Waste Management Master Plan will guide the Municipality's solid waste services for the next 25 years to meet the needs of citizens as identified during public consultation, municipal surveys and the Future Forward document. The Regional Solid Waste Management Master Plan includes five major waste diversion programs that will require both capital and operating expenses. During the budget process, each program will be budgeted accordingly, and will be presented for Council's review and approval.

ATTACHMENT:

1. Golder Associates Report - Regional Solid Waste Management Master Plan dated August 2007.

ADMINISTRATIVE RECOMMENDATION:

THAT the Regional Solid Waste Management Master Plan, dated August, 2007, be received as information and utilized by Administration to guide future business planning processes.

REGIONAL SOLID WASTE MANAGEMENT MASTER PLAN

Submitted to:
Regional Municipality of Wood Buffalo
9909 Franklin Avenue
Fort McMurray, AB
T9H 2K4

DISTRIBUTION:

20 Copies - Regional Municipality of Wood Buffalo
2 Copies - Golder Associates Ltd.
2 Copies - 2cg Inc.

August 2007 06-1329-031

EXECUTIVE SUMMARY

The Regional Municipality of Wood Buffalo (RMWB) is comprised of the City of Fort McMurray, which makes up a majority of the population, and the rural centers (Hamlets), the Hinterland, First Nations Reserves and the Shadow Population. The Hamlets include: Anzac, Conklin, Draper, Fort Chipewyan, Fort Fitzgerald, Fort Mackay, Gregoire Lake Estates, Janvier, Mariana Lake, and Saprae Creek. The Hinterland includes sparsely populated areas outside the urban and rural centers. The shadow population includes temporary residents, employed by the industrial and commercial sector.

The development of oil sands operations within the RMWB has provided the region with a strong economic foundation which has resulted in unprecedented growth. The RMWB experienced a relatively stable economy throughout the 1980s and 1990s however since 1999 it has sustained an annual 9% growth rate, nearly doubling the total population in just over 5 years. It is now among the 5 largest communities within the province of Alberta.

A comprehensive master planning process of all major municipal assets under the responsible care of the RMWB was initiated following the review of a Vision and Needs Report prepared for the RMWB. This document identified the development of a Solid Waste Master/Business Plan as a priority initiative.

The waste management system currently operating in the RMWB involves both waste disposal and diversion components as summarized below. The RMWB relies on contractors as much as possible to deliver the collection and landfill cover services. And does have some capacity to operate the system when contractors are not available.

Waste Disposal

The main RMWB landfill is located in Fort McMurray. This site accepts the majority of the waste disposed in the RMWB. A fleet of 10 municipal trucks collects residential garbage weekly from both the City and smaller communities in the region. The site recently received approval for an expansion. The new site will be operational in early 2008 and has an estimated approved capacity of 27,300,000 cubic meters including daily and final cover. In addition, landfill sites are currently operating in Conklin, Janvier and Fort Chipewyan. The Janvier site is anticipated to close in 2008 with Conklin being closed in 2009. The Fort Chipewyan landfill has approximately 1 year of approval capacity remaining. Approval of the new landfill in Fort Chipewyan is currently being finalized.

Between 2002 and 2005 the amount of waste disposed of in RMWB landfills increased from approximately 45,000 tonnes to over 81,000. Based on conservative population and waste generation growth number it is estimated that between 108,000 to 190,000 tonnes of waste could be generated in RWMB by 2010.

In addition to wastes disposed of in municipal landfills, between 45,000 and 120,000 tonnes of waste was disposed of in approved landfills at oil sands project sites in 2004 and 2005.

Using the 108,000 tonnes per year waste generation number and assuming this grew by 5% a year the Regional Landfill would have capacity for 45 years. If the waste generation tonnage grew by 10% per year the site would have capacity for 30 years. This would be further reduced if the oil sands projects began to dispose of waste in the Regional Landfill.

Waste Diversion

Over the years the RMWB has implemented a number of waste diversion programs for the residential and IC&I sectors. The focus on the diversion programs has been the establishment of recycling depots in the urban area of Fort McMurray. The following four recycling depots have been established and include:

- Thickwood;
- Timberlea;
- Franklin Avenue; and
- Fort McMurray Landfill Site.

Each depot collects ; cardboard; newspaper; mixed paper; glass ;tin; milk Jugs; and milk jug caps. The depots diverted 227 tonnes of material in 2005 and 433 tonnes in 2006. In addition to the depots waste diversion programs exist at the Fort McMurray Regional landfill site. Based on available 2005 data the overall diversion rate was estimated to be 2.4% and the residential diversion rate was estimated to be 8% (excluding C&D recycling of approximately 4,000 tonnes). The diversion rates are very low.

As part of the process of developing the Waste Management Master Plan a Steering Committee was established to assist in the development of the plan. The committee consists of representatives from:

- Municipal Staff;
- Industry;
- Alberta Environment; and
- Consulting Team.

At the Waste Management Steering Committee meeting held November 14, 2006 it was decided to proceed with a 50% waste diversion goal across wastes generated in the residential, IC&I and CRD sectors. What this means is that for every 100 tonnes of waste generated at least 50 tonnes should be diverted from landfill. In broad terms for 2005 this means that just over 40,000 tonnes would have been landfilled and the same amount would have been diverted.

ALTERNATIVES:

Five alternative waste management systems were developed with the goal of moving the RMWM towards this 50% goal and included:

System 1 – Status Quo with Enhanced Depot Operation
System 2 – Leaf and Yard Waste Collection and Processing
System 3 – Enhanced Construction Renovation and Demolition (CRD) Recycling
System 4 – Residential Curbside Collection and Processing of Dry Recyclables
System 5 – Residential Curbside Collection and Processing of Organics

ANALYSIS:

An analysis of the potential diversion achievable as each system is implemented is shown in Table 1.

TABLE 1
WASTE MANAGEMENT SYSTEM DIVERSION RATES

Component	System 1	System 2	System 3	System 4	System 5
Residential Waste diverted	**3,672**	**5,995**	**5,995**	**10,222**	**14,505**
Residential Diversion Rate	14%	22%	22%	38%	54%
IC&I Waste Diverted	**1,050**	**1,230**	**1,430**	**5,423**	**8,320**
IC&I Diversion Rate	**3%**	**4%**	**4%**	**17%**	**27%**
CRD Waste diverted	**0**	**0**	**19,400**	**19,400**	**19,400**
CRD Diversion Rate	**0%**	**0%**	**72%**	**72%**	**72%**
Total waste diverted	**4,722**	**7,425**	**26,825**	**35,045**	**42,225**
Overall Diversion Rate	6%	9%	31%	41%	50%

The analysis showed that the RMWB would have to implement Systems 2 through 5 to achieve a 50% diversion target.

The capital costs and annualized capital cost for each system is shown in Table 2.

TABLE 2
CAPITAL AND ANNUALIZED CAPITAL COSTS FOR WASTE MANAGEMENT SYSTEMS

System	Capital Cost ($)	Annualized Capital Cost ($)
1.Status Quo and Enhanced Depot	270,000	43,200
2. Leaf and yard Waste	740,000	96,000
3. CRD Recycling	1,540,000	202,200
4. Recycling Collection and Processing	8,160,000	997,000
5. Organics Collection and Processing	5,160,000	653,000

A financial model was developed to determine the yearly cost that would result with the implementation of the systems. In the model System 3 includes the cost of System 2, System 4 includes the costs of Systems 2 and 3 and System 5 includes the costs of Systems 2, 3, and 4. A summary of the systems costs is provided in Table 3.

TABLE 3
COST OF PROPOSED WASTE MANAGEMENT SYSTEMS

System	Operating Cost ($)	Capital Cost ($)	Total System Cost ($)	Cost Per Tonne ($2006)
1.Status Quo and Enhanced Depot	6,510,000	40,000	6,550,000	77
2. Leaf and yard Waste	6,530,000	140,000	6,670,000	78
3. CRD Recycling	6,340,000	340,000	6,680,000	78
4. Recycling Collection and Processing	6,360,000	1,340,000	7,660,000	90
5. Organics Collection and Processing	6,580,000	2,000,000	8,500,000	100

As shown in Table 3 the total system costs will increase with the implementation of the proposed waste diversion programs. System 1 or the status quo is the cost assumed when the new landfill site is made operational and three new depots are added. If the new Regional landfill was operational and the new depots were constructed the cost of the system would be $6.6 million. This is $2.4 million above the 2005 actual costs incurred to operate the existing landfill and depot recycling system. Therefore the costs difference to implement Systems 2 through 5 would be $1.7 million per year.

Key Recommendations

The following are general recommendations reached in the analysis:

- The RMWB should adopt a 50% diversion target from disposal for the Residential, IC&I and CRD sectors;
- Given the amount of capital expenditure required to provide the infrastructure to achieve the 50% target discussions with the provincial government and oil sands companies should be initiated to request additional funding support;
- If funding from Government and industry is not available then a diversion target of 25 % would be more realistic;
- The required diversion infrastructure must be developed and practical collection programs implemented in both urban centre of Fort McMurray with companion programs being provided in the rural centres;
- If curbside collection of dry recyclables is implemented in the urban centre the existing depot infrastructure could be transferred to the rural centres;
- As each different program is implemented a comprehensive education and communications program will need to be developed to inform the system users of the changes.
- The RMWB should provide core collection, recycling, composting and Landfilling services itself, relying on contractors to supplement the services during peak periods. This approach will provide the most reliable service.
- The RMWB should also review in detail its collection fleet and consider a more automated set of trucks for urban garbage collection at least.
- The key issue of truck access to collect garbage from multifamily buildings must be addressed to reduce the RMWB liability for damage to private property (vehicles and pavement in private parking lots). Collection from these buildings could be implemented once the property owners have agreed to an appropriate liability waver. Alternatively the property owners could contract the collection of garbage to others.
- In managing the landfill the RMWB should examine all alternatives for daily cover to find the most cost effective material that minimizes the volume used in the landfill. These alternatives may include excess construction fill, recycled construction and demolition waste, composted biosolids, synthetic covers and others which may become available in the future.
- As the Janvier and Conklin landfill sites close, new systems to handle and transport the waste will have to be developed.
- Finally, this master plan should be considered a “living document” and the municipality should continue to review and integrate the regional waste management system with other related initiatives in the region.

Implementation Plan

Using a 5 year planning window the following implementation plan is proposed to reach the target:

- Construct a MRF (2007/2008) and implement residential collection of dry recyclables (2008) in the urban and rural areas; The MRF design should include the capacity to separate, and bale film plastic from bags.
- Construct a leaf and yard waste compost pad at the Regional Landfill (2008) and collect leaf and yard waste from the urban and rural areas for delivery to the sewage treatment plant organics processing facility or the pad constructed at the Regional Landfill (2009); Plastic bags should be collected and delivered to the MRF for processing.
- Construct an area at the Regional Landfill (2009) for the storage and processing of CRD wastes and tender to the private sector for processing or purchase appropriate equipment to process the material (2010);
- Construct a organics processing facility (2011) and implement organics collection in the urban and rural areas (2012). The facility should also be designed to separately collect plastic bags containing the waste organics. These would be delivered to the MRF for baling and marketing.

With implementation of each program discussions should occur with the oil sands companies to determine their willingness to deliver wastes generated at their facilities to the Regional facilities. Sizing of the facilities should take into consideration waste generated in the IC&I sector. Discussions and detailed planning should also be conducted for each rural hamlet regarding siting options and other details to implement collection and recycling.

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Acknowledgments

The completion of the Regional Municipality of Wood Buffalo Waste Management System Plan would not be possible without the contribution of the Steering Committee. We would like to thank all of the members of the committee for their time, effort and input during the development of the study.

Specifically we would like to thank the following committee members (Alphabetical order):

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Derek Chubb (Suncor Energy Inc.)
Don Reimer (Regional Municipality of Wood Buffalo)
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Jim Macpherson (Nexen Inc.)
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Definitions

ABRC	Alberta Beverage Container Recycling Corporation
AE	Alberta Environment
ARMA	Alberta Recycling Management Association
BCMB	Beverage Container Management Board
C&E	Communications and Education
CRD Waste	Construction, Renovation and Demolition waste
GHG	Greenhouse Gases
Kg/capita	kilograms per capita
Hinterland	Includes sparsely populated region outside the urban and rural centres
IC&I	Industrial, Commercial and Institutional
AUOMA	Alberta Used Oil Management Association
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste. Solid refuse or garbage generated by the residential, institutional, commercial and industrial sectors.
Residential MSW	Solid waste generated by the residential sector
Rubble	Broken pieces of concrete and asphalt
Rural	In this report rural means the Hamlets of Anzac, Conklin, Draper, Fort Chipewyan, Fort Fitzgerald, Fort MacKay, Gregoire Lake Estates, Janvier, Mariana Lake, and Saprae Creek.
RMWB	Regional Municipality of Wood Buffalo
Shadow Population	Temporary residents who are employed by the industrial and or commercial sector.
Steering Committee	The steering committee was comprised of industry, the RMWB, Alberta Environment and the consulting team to facilitate the exchange of information, communication and ideas.
Yr/hhld	Year per household

1.0 INTRODUCTION

1.1 General

The Regional Municipality of Wood Buffalo (RMWB) retained Golder Associates Ltd. in association with 2cg Inc. and Fort McKay Environmental to provide the RMWB with a Solid Waste Management Master/Business Plan (System Plan) to assist staff and council in making decisions on future waste programs for the municipality. The primary objectives of the study are:

- Review waste characteristics and make projections for the short and long term future;
- Evaluate collection and disposal practices;
- Examine current environmental initiatives within the residential, commercial and industrial sectors and determine the baseline waste diversion potential;
- Provide a synopsis of best practices in solid waste management in similar size municipalities;
- Review and assess existing and alternative business models;
- Perform stakeholder outreach to interface with council, senior management and major industry;
- Utilize the results of previous public outreach efforts conducted by the consultant the DAGNY Partnership;
- Assess the condition and operating capacity of the major solid waste management facilities within the RMWB and immediate surrounding areas including landfills(s), transfer stations(s), and recycling depot(s);
- Assess the fleet requirements for solid waste including maintenance facilities and vehicle replacement programs;
- Develop strategies to reduce waste and maximize operational efficiency; and
- Explore potential synergies between RMWB and private industry.

This report provides information that supports the objectives of the study and provides descriptions and estimated costs for several alternative waste diversion and collection systems for consideration by the RMWB.

1.2 Background

The RMWB is comprised of the City of Fort McMurray, which makes up the majority of the population, and the rural centers (Hamlets), the Hinterland, First Nations Reserves and the Shadow Population. The Hamlets include: Anzac, Conklin, Draper, Fort Chipewyan, Fort Fitzgerald, Fort Mackay, Gregoire Lake Estates, Janvier, Mariana Lake, and Saprae Creek. The Hinterland includes sparsely populated areas outside the urban and rural centers. The shadow population includes temporary residents, employed by the industrial and commercial sector.

Fort Chipewyan is a northerly community and is currently the most populated Hamlet at just under 1,000 residents. Fort Chipewyan is unique as compared to the other populated Hamlets, because it only has road access in and out of the community two months of the year

The development of oil sands operations within the RMWB has provided the area with a strong economic foundation which has resulted in unprecedented growth. The RMWB saw a sustaining economy throughout the 1980s and 1990s however since 1999 it has sustained an annual 9% growth rate, nearly doubling the total population in just over 5 years. It is now among the 5 largest communities within the province of Alberta.

To ensure continued growth and prosperity, proper planning and municipal investment are required. A comprehensive master planning process of all major municipal assets under the responsible care of the RMWB was initiated following the review of a Vision and Needs Report prepared for the RMWB. This document identified the development of a Solid Waste Master/Business Plan as a priority initiative.

The RMWB considers environmental responsibility fundamental to the management of the Region. This commitment to environmental stewardship is being demonstrated through the development of waste diversion programs that raise ecological awareness and protect the environment at large. Solid waste is a cornerstone of the environmentally responsible initiatives and the Solid Waste Master/Business Plan should exhibit an appreciation of this outlook.

1.3 RMWB Current Waste Management System

The waste management system currently operating in the RMWB involves both waste disposal and diversion components. Each is summarized below with greater detail being provided in other sections of the report.

Waste Disposal

The main RMWB landfill (Regional Landfill) is located in Fort McMurray. This site accepts the majority of the waste disposed of in the RMWB. The site recently received approval for an expansion. The new site will be operational in late 2007 or early 2008 and has an estimated approved capacity of 27,300,000 cubic metres including daily and final cover. When the soil requirements are removed the site has capacity for 20,500,000 cubic metres of waste. In addition, landfill sites are currently operating in Conklin, Janvier and Fort Chipewyan. The Janvier site is anticipated to close in 2008 with Conklin being closed in 2009. As the sites close, systems to handle and transport the waste to other facilities will have to be developed. The Fort Chipewyan landfill has approximately 1 year of approval capacity remaining. Final approval of the new landfill in Fort Chipewyan is currently being finalized.

Between 2002 and 2005 the amount of waste disposed in RMWB landfills increased from approximately 45,000 tonnes to over 81,000 tonnes.

In addition to wastes disposed of in municipal landfills, between 45,000 and 120,000 tonnes of solid waste was disposed of at oil sands project sites in 2004 and 2005.

Based on conservative population and waste generation growth numbers it is estimated that between 108,000 to 190,000 tonnes of waste could be generated in the RMWB by 2010.

Using the 108,000 to 190,000 tonnes per year 2010 waste generation numbers and assuming these grew by 5% a year the Regional Landfill would have capacity for between 25 to 45 additional years. If the waste generation tonnage grew by 10% per year the Regional Landfill would have capacity for between 17 to 30 additional years. This would be further reduced if the oil sands projects began to dispose of waste in the Regional Landfill.

The RMWB operates the waste collection system and the landfill will heavy reliance on contractors. This has led to significant difficulties. As a result collection is now operated by the municipality and landfill cover placement is not always implemented in a timely manner, given that the contractors are difficult to schedule for the work. Consequently the RMWB may be able to provide more reliable service by owning sufficient equipment to conduct the majority of work itself, calling on contractors to assist during peak periods. The municipality should also continuously be evaluating alternative landfill cover materials as they become available with the goal being to find the lowest cost cover which takes the least space in the landfill. Such material might include, excess fill for construction projects, composted biosolids, synthetic materials, and recycled C&D waste.

The municipality currently operates 10 collection trucks. When the alternatives described later in this report for diversion of waste from landfill are implemented, these trucks will need to be supplemented by more automated and efficient vehicles for urban collection. The current vehicles might be reserved for collection from the rural hamlets in the future. There are a number of other cities of similar size to compare with for waste collection. For example the City of Prince George is now collecting all of their residential waste with 5 fully automated trucks. The RMWB will need to examine the details of systems like this during the implementation process.

Waste Diversion

Over the years the RMWB has implemented a number of waste diversion programs for the residential and IC&I sectors. The focus on the diversion programs has been the establishment of recycling depots in the urban area of Fort McMurray. The following four recycling depots have been established and include:

- Thickwood;
- Timberlea;
- Franklin Avenue; and
- Fort McMurray Regional Landfill.

Each depot collects the following materials:

- Cardboard;
- Newspaper;
- Mixed Paper;
- Glass;
- Tin;
- Milk Jugs; and
- Milk Jug caps.

The depots diverted 227 tonnes of material in 2005 and 433 tonnes in 2006. In addition to the depots, waste diversion programs exist at the Fort McMurray Regional landfill site.

In addition to these diversion programs, between 20,000 and 36,000 tonnes of waste was diverted at oil sands project sites in 2004 and 2005. The oil sands waste programs are described in greater detail in Appendix B.

1.4 Waste Diversion Goals and Objectives

Alberta Environment developed "Alberta's Municipal Waste Action Plan 2004-2006" (AE, 2004) in which a goal of 500 kg/capita waste disposal (i.e., residential, IC&I and CRD) was set. Currently the provincial average is just over 800 kg/capita. The intent is that Albertans will reduce waste disposal through waste reduction or recycling programs in all three sectors.

As part of the process of developing the Waste Management Plan, a Steering Committee was established to assist in the development of the Solid Waste Management Master/Business Plan. The committee consists of representatives from:

- Municipal Staff;
- Industry;
- Alberta Environment; and
- Consulting Team.

At the Waste Management Steering Committee meeting held November 14, 2006 it was decided to proceed with a 50% consolidated waste diversion goal across wastes generated in the residential, IC&I and CRD sectors. What this means is that for every 100 tonnes of solid waste generated at least 50 tonnes should be diverted from landfill. In broad terms for 2005 this means that just over 40,000 tonnes of solid waste would have been landfilled and the same amount would have been diverted. The municipality has partially achieved this goal with C&D stockpiling. In addition contaminated soil has been land farmed and recycled as cover for the landfill to save costs and assist with meeting legislative requirements.

2.0 ASSESSMENT OF CURRENT WASTE DIVERSION PROGRAMS

2.1 Introduction

The RMWB has implemented a number of diversion programs for the residential and IC&I sector. Presently, these programs are primarily available for the urban centre (i.e., City of Fort McMurray).

Fort Chipewyan is a northerly community and is currently the most populated Hamlet at just under 1,000 residents. Fort Chipewyan is discussed here separately because, unlike the other populated Hamlets, it only has road access in and out of the community two months of the year. This greatly impacts the cost of recycling for Fort Chipewyan, especially as it pertains to transporting recyclables to markets. For example, Fort Chipewyan segregates crushes and transports discarded appliances to the Regional Landfill in Fort McMurray, every second or third year. This costs roughly $2,000 per load.

In this section, the RMWB's existing residential and IC&I green programs are reviewed for both the **urban** (City of Fort McMurray) and **rural** (Hamlets) centers. This includes an assessment of the following:

- tonnes/year diverted;
- cost/tonne diverted;
- possible options to improve the current programs including costs; and
- environmental and social benefits.

Discussion of IC&I is focused on non-oil sands recycling activities. Waste management and waste diversion at the oil sands sites are described and reviewed in Section 3.11.

2.2 Past Studies and Plans

In recent years, the RMWB has undertaken a number of studies which examined methods of diverting more waste from landfill disposal. A strategy to divert waste through an enhanced depot system and a dedicated Materials Recovery Facility (MRF) was developed by the consultant EBA in 2004. The MRF would be used to sort and bale recycled material recovered from the depot recycling program discussed in Section 2.3.1. Council has approved the construction of a MRF facility for 2008.

In 2005, the consultant Sonnevera International Corp. developed a number of recommendations to improve recycling at the depots. The recommendations were derived based on a site tour of the depots and discussions with RMWB staff. Recommendations from this report are summarized below (Sonnevera, 2005):

- Choose consistent colour scheme and bin type for each material at all depots. This includes consistent, visible and concise signage and information for recycling depot users. Bin openings should be designed to control contamination (i.e. targeted to specific materials).
- Collect same materials at all depots.
- Maintain bins in good conditions.
- Investigate opportunities for a temporary processing facility to house a cardboard baler until proposed MRF is fully operational.
- Develop an ongoing public education and awareness program targeted at changing behaviour through effective community based social marketing techniques.
- Develop a consultation process to identify waste management goals and objectives that will guide future waste reduction and recycling in the RMWB.

Also in 2005, the consultant The DAGNY Partnership developed a comprehensive three year public education and awareness campaign on recycling and waste management. This campaign is underway and discussed further in Section 2.3.7.

Prior to implementing the recycling initiatives by DAGNY, the consultant Banister Research & Consulting Inc. was hired to conduct a survey of Fort McMurray residents. The survey was used to find out the level of recycling activity among residents, and opinions and perceptions regarding recycling (Banister, 2006). The survey was also used to measure the awareness, knowledge and participation of the municipal depot program, and was used to test perceptions of key campaign messages and slogans (Banister, 2006).

The RMWB completed a five year recycling project plan 2005-2010, including the documents titled: *RMWB Recycling Project Plan.* The *RMWB Recycling Project Plan* identifies specific tangible project outputs. The RMWB lists these outputs as:

- enhancing and standardizing current depots;
- adding new depots (urban and rural);
- building a Materials Recovery Facility;
- implementing a commercial and service sector cardboard recycling program;
- implementing a yard refuse program and communications plan to educate the public (RMWB, 2005).

Intangible outputs include: increasing the RMWB's sustainability profile, and raising public awareness on recycling (RMWB, 2005).

2.3 Current Waste Diversion Initiatives

Waste diversion initiatives currently available to the residential and IC&I sector include the following:

AT Recycling depots:

- Milk jug recycling;
- Beverage container recycling;
- Metal, glass, cardboard and paper.

At Landfill:

- Tire, Electronic and Used Oil Recycling;
- Recycling at the Regional Landfill as at Depots;
- Electronic waste recycling.

2.3.1 Recycling Depots

There are presently four existing recycling depots located at Franklin Avenue, Timberlea, Thickwood and the Regional Landfill. New depots are planned to be opened with tentative locations at: Saprae Creek-fire hall; Anzac; Gregoire Park area; and MacDonald Island Recreational Facility. These locations have not been finalized.

Presently, there are no recycling depots in the Hamlets. There is one depot in Fort Chipewyan but it has not been active in two years, as there is no operator. The depot in Anzac was removed until a permanent solution is determined.

The DAGNY Partnership presented a detailed strategy in 2005 that focused on maximizing the use of local recycling programs.

Information on the www.recycle-more.ca website informs residents about locations, acceptable materials and recycling statistics.

Information on the tonnages recycled at the depots was obtained from interviews with the RMWB and from data supplied by the RMWB (RMWB Waste Inventory, 2006). A summary of 2005 and 2006 depot diversion data is given in Table 2.1.

TABLE 2.1
TONNAGES COLLECTED AT RECYCLING DEPOTS (2005 AND 2006)

Recycled Material	2005	2006
	Tonnes per year	
Paper	180	278
Cardboard	41	103
Tin /Glass/Plastic	4 (glass) 2 (plastic)	44 (plastic, tin, glass)
Total	**227**	**425**

Possible improvements to the existing depot recycling program include the following:

- Continue to improve the depots as described by the Sonnevera report and ensure the barriers to depot usage are limited, as detailed by the DAGNY Partnership (DAGNY 2005), by ensuring the following:

    - Location should be visible;
    - Landscaping used to create a recycling zone for depots located in parking lots;
    - Make bins attractive;
    - Add garbage bin for non recyclables;
    - Operate more frequent pickups and site is clean;
    - Enhance lighting;
    - Add bench for sorting;
    - Improve directions to depot (i.e. from the streets leading to the depots); and
    - Continue current (2005-2007) recycling education and awareness campaign.

Possible options to expand this program include the following:

- Add new recycling depots in rural areas.
- With the closing of some rural landfills (i.e., Conklin and Janvier), another possible option would be to create transfer stations and to combine these transfer stations with recycling depots (i.e., currently a contractor hauls waste from the Hamlets directly to the Regional Landfill in Fort McMurray).

In order to avoid miss-use of these facilities, the depots would have to be secure. Options include: fencing and gates equipped with a card swipe system for qualified residents to use, managed part of the week and security cameras.

To accommodate rising CRD waste from new housing and housing renovations, a larger CRD waste bin could possibly be added to some or all of these depot facilities. Yard waste may be accommodated with an additional bin at the depots or a separate depot for leaf and yard waste. If a separate depot for leaf and yard waste is added then these depots can be possibly located in public open spaces such as parks.

The *RMWB Recycling Project Plan* estimated the capital cost of an urban recycling depot to be about $40,000 and the annual operating cost to be about $75,000 (RMWB, 2005). This includes the purchasing of new bins.

The RWMB should not be competing with the private sector to provide waste management services to the commercial sector. The exception would be Fort Chip due to its isolation.

2.3.2 Milk Jug Recycling

Recycling of milk jugs is available at the recycling depots. In 2006 approximately 24 tonnes were captured for recycling, as per information provided by the RMWB.

The transport cost for milk jugs is $900 per trip and the RMWB receives $200 refund for every tonne diverted from the Dairy Council.

Possible improvements and expansion to this program include the following:

- Include information on the www.recycle-more.ca website on milk jug recycling and provide a link to the Dairy Council website (http://www.milkcontainerrecycling.com/AB/);
- Include a bin for milk cartons at the recycling depots; and
- Invest in densification equipment (bailer and chipper to reduce the bulk) bale or granulate.

The costs to provide the web-link are minimal. In addition to transport costs, the capital costs to provide an additional bin for milk cartons would be $5,000 to $7,000 (2006 dollars) per recycling depot.

2.3.3 Bag Limit

The RMWB had an existing bag limit (i.e., limits the number of refuse bags each household can place on the curb) of 7 bags per week which was changed 4 bags/week in the new waste bylaw adopted on January 7, 2006 for the City of Fort McMurray (RMWB Utility Rate Bylaw 06-034).

2.3.4 Plastic Bag Recycling

On May 9th 2007 the RMWB unanimously passed a Notice of Motion asking the administration to examine the feasibility of banning the use of plastic grocery bags in the region.

Plastic bags are not currently recycled in the region. They are widely used by residents and create a growing problem when they are delivered to the landfill. The problems include windblown bags around and off the landfill site, drainage blockage, potential to collect water thus encouraging the growth of insect and disease vectors, potential to limit the normal soil moisture and nutrient processes and potential to negatively impact wildlife.

Several alternatives are open to address these problems.

Plastic bags could be banned from use altogether. This would be difficult to implement as the population would be required to adopt a major cultural change. If this option were implemented

the RMWB would need to ensure that an attractive alternative to plastic bags was available to the public.

The RMWB could enhance its bag limit bylaw by adding a bag charge. This would encourage the public to limit their use of plastic bags.

Alternative low density polyethylene bags are becoming available which decompose over time. These bags would not create the same difficulties in the landfill as they are partly made of corn starch and thus break down in the soil or during composting. They would be a viable alternative to the currently used high density polyethylene bags.

Another viable alternative will become available once the MRF is constructed. The MRF should have the capacity to process, bale and market plastic bags and other forms of plastic. Markets exist to reprocess the plastic to make new products and to use the plastic as fuel for electricity generation. A market for RMWB plastic in the future could be the City of Edmonton who is installing generators fueled by plastic waste. Once the MRF and Compost facility are operational all collected waste will enter one of the two facilities and all plastic bags can be collected and baled. This will eliminate the need for the plastic bags to go to the landfill.

2.3.5 Beverage (Deposit) Container Recycling

Annual RMWB beverage (deposit) container recycling tonnage data was obtained from the Alberta Beverage Container Recycling Corporation (ABCRC) and the Beverage Container Management Board (BCMB). Container recycling between 2002 and 2005 ranged from 1,500-1,800 tonnes as outlined in Table 2.2. The RMWB currently operated one beverage (deposit) container depot within the City of Fort McMurray.

TABLE 2.2
BEVERAGE (DEPOSIT) CONTAINER TONNAGES DIVERTED FOR RMWB (2002-2005)

	2002	2003	2004	2005
	Tonnes			
Deposit Containers	144	150	157	166
Deposit Containers-Beer	1,332	1,322	1,390	1,617
Total	**1,476**	**1,472**	**1,547**	**1,784**

Possible improvements and/or expansion to this program include the following:

- Provide information on the www.recycle-more.ca website on deposit containers and re-emphasize that the depots accept deposit containers as well as the “Advanced Bottle Depot”.
- Provide links to the ABCRC website (http://www.abcrc.com) and to the BCMB website (http://www.bcmb.ab.ca/).

The costs to provide the web-links are minimal.

2.3.6 Tires, Electronics and Used Oil

The Alberta Recycling Management Association (ARMA) was contacted to determine the amount of tires collected for recycling in the RMWB. The contractor, Alberta Environmental Rubber Products, collects tires for recycling from local businesses. They reportedly collected 936 tonnes in the last year primarily from the City of Fort McMurray with some tonnage from the Syncrude and Suncor oil sand sites.

The ARMA was contacted to determine the amount of electronics collected in the RMWB. The RMWB has collected and shipped, to a qualified Alberta processor, 7.83 tonnes of waste electronics since October 2004.

Alberta Used Oil Management Association (AUOMA) was contacted to obtain information on the amount of used oil collected. They were not able to provide a breakdown of the oil collected for the RMWB.

2.3.7 Recycling at the Landfill

In addition to household recyclable materials, the household hazardous waste depot at the Regional Landfill also accepts batteries, used oil and filters, anti-freeze and coolant, paint, propane tanks (maximum 9kg), tires (maximum 600 mm), concrete and asphalt, E-waste (TVs, VCRs, computers), clean wood (recovered material without spikes, nails, or other dangerous material), and compostable organic material (e.g., yard waste and other organics).

Appliances are accepted free of charge (with a $3.00 entry fee) when Ozone Depleting Substances (ODS) have been removed and a fee of $39.05 is charged when the ODS have not been removed.

Metal is also accepted at the landfill site including rebar, and sheet metal.

In 2006 about 73,300 tonnes of wastes were diverted directly at the Regional Landfill including 72,000 tonnes of C&D waste. This CRD waste came from various construction/renovation/demolition projects in the RMWB.

Table 2.3 presents an overview of recycling capture rates at the Regional Landfill in 2006.

TABLE 2.3
REGIONAL LANDFILL RECYCLING TONNAGE (2006)

Recyclable Material	2006 (tonnes)
E-Waste	24
Batteries	45
Propane Tanks	17
CFC Units	39
Metals	1,010
Tires (assume 11 kg per tire)	68
Oil (assume 800 kg/m^3)	50
Anti-freeze (1096 kg/m^3)	8
Paints/Solvents (1000 kg/m^3)	8
Concrete	47,000
Asphalt	25,000
Total	**73,269**

1. Tonnes (batteries, CFC units, Tires, Oil, Antifreeze, Paint/Solvents) approximated based on assumed densities and weight per unit. Concrete and Asphalt tonnage estimated for November and December.

2.3.8 Education and Awareness Program

Suncor and the Suncor Energy Foundation provided the RMWB $100,000 per year for three years to develop a public education and awareness campaign on recycling and waste management (Suncor, 2005). This funding has resulted in the a number of initiatives including the www.recycle-more.ca website, which contains general information on how residents can reduce, re-use and recycle, recycled tonnage tracking from the depots, and information on the recycling depots, their location and acceptable materials. The funding has also resulted in the Community Analysis Report, depot improvements, awareness initiatives and the Recycling Education and Awareness Social Marketing Strategy 2005-2008, developed by the DAGNY Partnership.

The DAGNY Partnership, 2005, summarized five program streams to promote recycling. These program streams are identified as:

- Promotional Tool Box (includes website design, recycling facts sheets, waste recycling hotline, TV spots, other items);
- Public Awareness (includes: fall recycling awareness campaign, media relations program, and other items);
- Participation Building (includes: educational outreach program, master recycler program, other items);
- Community Outreach (includes: community green team, other items); and
- Evaluation and Project Management (includes: attitude survey, budget management, and other items).

This multi-year strategy has been implemented (2007 is the third year of the three year program) by the DAGNY Partnership under the direction of the RMWB/Suncor Steering committee.

2.4 Summary of Tonnages, Costs, Environmental and Social Benefits

Currently there are a number of waste diversion initiatives in the RMWB. From the 2006 data we obtained, the total amount of waste diverted from the recycling depots and landfill was approximately 1,700 tonnes (i.e., excluding asphalt and concrete). In addition 936 tonnes of tires were recycled in 2006. Out of the total amount of waste diverted the depots divert about 400 tonnes. Recycled asphalt and concrete represent another 72,000 tonnes diverted in 2006, and is generated from in town construction projects. This number is not expected to continue on a long term annual basis.

Table 2.4 summarizes the RMWB current waste diversion programs and their calculated diversions.

TABLE 2.4
TOTAL WASTE DIVERSION
RMWB 2005 and 2006

Waste Reduction Initiative	2005		2006	
	Tonnes/yr	Kg/capita	Tonnes/Yr	Kg/capita
Recycling Depot	227	3.3	425	6.1
Milk Jug Recycling	NA	NA	24	0.35
Bag Limit	NA	NA	NA	NA
Beer Container Recycling	1,617	23.3	NA	NA
Beverage Container Recycling	166	2.4	NA	NA
Tire Recycling	NA	NA	936	13.5
Electronics	NA	NA	NA	NA
Used Oil	NA	NA	NA	NA
Recycling at Landfill	NA	NA	1,269	18.3
Asphalt and Concrete	NA	NA	72,000	1038
Total	**2010**	**29**	**74,654**	**1076**

1. **Population used is 69,368 (from 2006 Census and excludes camps) (RMWB, 2006).
2. Totals based on available data.
3. 7.83 tonnes of electronics have been recycled 2004 to date.

The total actual cost for all of the recycling programs in 2005 was $696,721 and includes the debt and financing costs of to pay down capital expenditures. The actual cost for 2006 was $567,350 which again includes debt and financing costs and also the cost for the recycling depot expansion expenditures. With some upcoming changes, these costs are expected to be reduced next year. The above costs do not include the beverage (deposit) container return program, which is self-funded, nor do the above costs include any costs to run the tire recycling, electronics and used oil programs.

Advantages to diversion include: extending landfill capacity, avoiding certain costs associated with landfill development, becoming environmental stewards in the Province and protection of

the environment. In addition significant greenhouse gas (GHG) reductions can be achieved with the implementation of diversion programs.

2.5 Summary

Recycled quantities data is incomplete. Based on available 2005 data the overall diversion rate was estimated to be 2.4% and the residential diversion rate was estimated to be 8%.

The goal is to have an overall 50% waste diversion rate.

3.0 WASTE GENERATION AND CHARACTERIZATION

In this section, waste generation in the RMWB is examined from 2002 to 2005. In 2003 EBA Engineering Consultants Ltd. (EBA, 2004) undertook a waste characterization study for the residential and IC&I (Industrial/Commercial/Institutional) sectors in the RMWB. This data was compared to waste composition data used in the recent national Municipal Solid Waste Options report (MSW 2006) to help estimate the tonnages of various waste streams that could be available for recycling or composting. Appendix A contains three tables that further breakdown the waste stream into categories (i.e., paper, plastics, metal etc.). These categories are further broken down into sub-categories (i.e., newspaper, magazines, phone books, cardboard etc.). The total tonnage for the sector (Residential or IC&I) is estimated by multiplying the percentages by the total tonnage to arrive at an estimated tonnage in the total waste stream.

Wastes generated and managed directly on the oil sand sites are discussed in Section 3.8

3.1 Waste Disposal

Table 3.1 depicts waste disposal in the RMWB Regional Landfill from 2002-2005 (Note: also includes some waste originating from oil sand sites). The data was assembled from best available information provided by the RMWB and includes population data and waste tonnage data. It should be noted that the 2003 data provided was incomplete and thus data for the IC&I tonnage and population data was extrapolated. The population data does not include the shadow population. This was done because they typically do not appear to contribute significantly to wastes entering RMWB facilities. They handle much of their own waste and recycling programs on-site. Wastes generated by the oil sands projects are discussed in greater detail in Section 3.8.

The data in Table 3.1 presents a reasonable estimate of the waste disposed of in the Regional landfill between 2002 to 2005.

TABLE 3.1
WASTE DISPOSAL IN THE RMWB REGIONAL
2002-2005

	2002	2003	2004	2005
	t/yr			
Residential	13,312	14,104	12,950	23,133
IC&I	18,500	19,600	19,905	30,402
CRD	12,297	25,867	18,700	27,089
Total	**44,109**	**59,571**	**51,555**	**80,624**
Households	16,864	18,657	18,571	19,571
kg/hhld	2,616	3,193	2,776	4,120
Population	**50,254**	**52,240**	**59,427**	**63,998**
kg/capita	878	1,140	868	1,260

In general there has been growth in waste generation with some fluctuation. In particular the CRD waste fraction fluctuates considerably and appears to be a function of ongoing development projects in the oil sands. The increase in CRD waste has also been a result of construction projects in Fort McMurray itself (i.e., road construction). This fluctuation in incoming wastes greatly influences the per capita waste generation rates disposed.

Table 3.1 shows that between 2002 and 2005, total waste disposal appears to have grown by approximately 83% while the population appears to have grown by 27%, a strong indication that the increase in waste generation is outpacing population growth. Notwithstanding the fluctuations in CRD quantities, both residential and IC&I waste generation increased considerably in 2005.

It is likely that waste generation will continue to increase at least to the extent of population growth but more likely at a pace dictated by the pace of the oil sands development projects.

3.2 Waste Diverted

As outline in section 2.0 the current recycling programs available in the RMWB include:

AT Recycling depots:

- Milk jug recycling;
- Beverage container recycling;
- Metal, glass, cardboard and paper.

At Landfill:

- Tire, Electronic and Used Oil Recycling;
- Recycling at the Regional Landfill as at Depots; Electronic waste recycling
- Electronic waste recycling

These services are available to both the residential and IC&I sectors. Table 3.2 provides a summary of the tonnes diverted between 2002 and 2005.

TABLE 3.2
RMWB WASTE DIVERTED (TONNES)
2002-2005

Program [1]	2002	2003	2004	2005	2006
Depots	**NA**	**NA**	**NA**	**227**	**425**
Milk Jugs	**NA**	**NA**	**NA**	**NA**	**15**
Deposit Containers	**144**	**150**	**157**	**166**	**NA**
Deposit Containers – Beer	**1332**	**1322**	**1390**	**1617**	**NA**
Tires	**NA**	**NA**	**NA**	**NA**	**936**
Landfill	**NA**	**NA**	**NA**	**NA**	**1,269**
Total	**1476**	**1472**	**1547**	**2010**	**2,654**

1. The data for the tonnes diverted from the depots, milk jugs, and landfill in Table 3.2 were estimated based on available information from the RMWB. In some instances, Tonnes are approximate and are based on assumed densities and weights per unit.

About 7.8 tonnes of electronic waste has been recycled from 2004 to 2006. The waste diversion data in Table 3.2 does not include CRD (asphalt and concrete) waste diversion quantities.

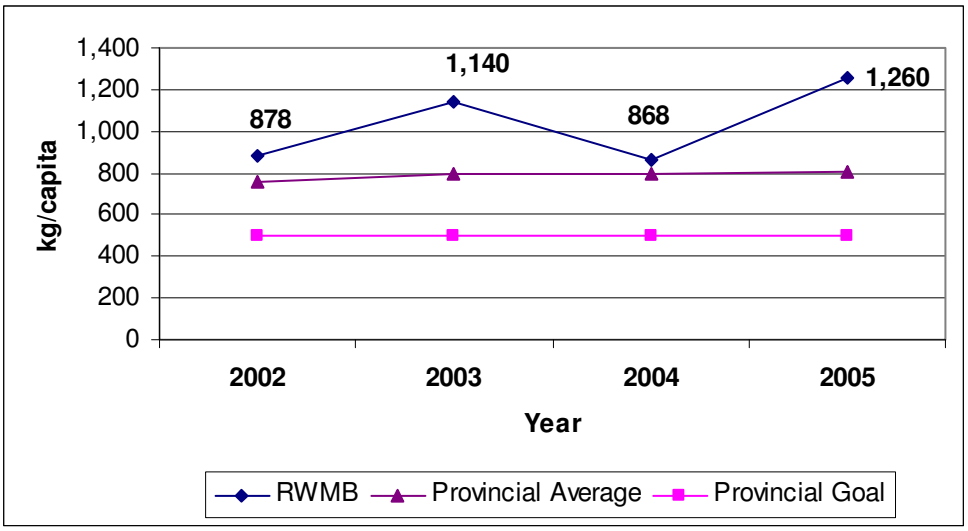
The deposit container information was obtained from the Beverage Container Management Board (BCMB) and the Alberta Beverage Container Recycling Corporation (ABCRC). Tires and electronic waste tonnages were obtained from Alberta Recycling Management Association (ARMA).

3.3 Per Capita Waste Disposal

Alberta Environment developed "Alberta's Municipal Waste Action Plan 2004-2006" (AE, 2004) in which a goal of 500 kg/capita waste disposal (i.e., residential, IC&I and CRD) by 2010 was set. Currently the provincial average is just over 800 kg/capita. The intent is that Albertans will reduce waste disposal through waste reduction or recycling programs in all three sectors.

Figure 3.1 depicts the current status of waste disposal in the RMWB (Residential, IC&I and CRD but excluding oil sand site wastes disposed and recycled on-site) and includes province wide averages as well as the waste disposal goal. On this basis the RMWB is clearly and consistently above the provincial average and far away from the Province's goal.

FIGURE 3.1
PER CAPITAL WASTE DISPOSAL
IN RMWB AND ALBERTA



In some years the per capita waste disposal is greater than 1,100 kg/capita, which appears to coincide with fluctuations in CRD disposal.

3.4 Waste Sector Breakdown

According to Alberta Environment the breakdown of 2005 waste disposal in Alberta was 41% Residential, 46% IC&I and 13% CRD. Figure 3.2 and Table 3.3 depict the breakdown of waste disposal in the RMWB and clearly show that CRD disposal is much higher than the provincial average and that this in turn depresses Residential and IC&I disposal percentages.

FIGURE 3.2
BREAKDOWN OF RMWB WASTE DISPOSAL BY SECTOR
(2002 TO 2005)

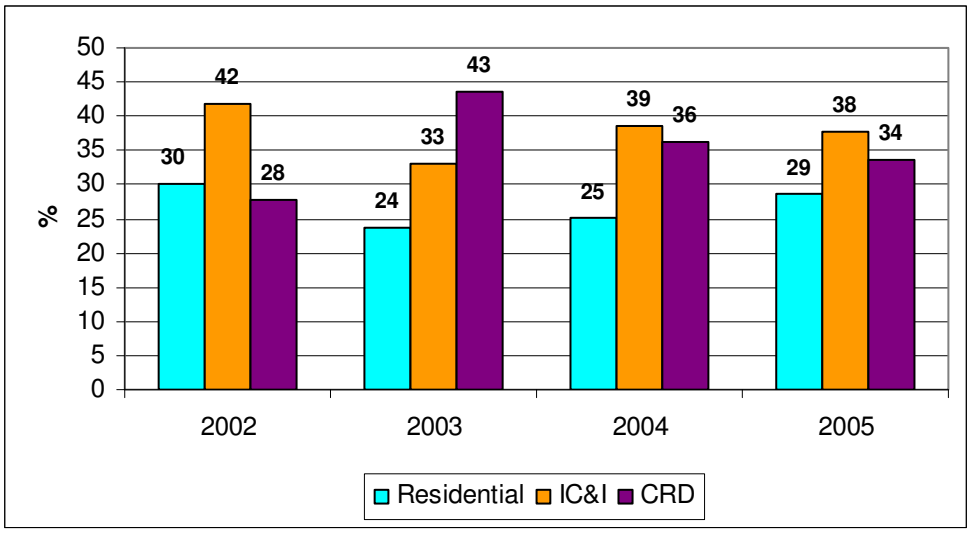


Figure 3.3 depicts the average breakdown from 2002 to 2005.

FIGURE 3.3
AVERAGE RMWB WASTE DISPOSAL BREAKDOWN BY SECTOR
(2002 to 2005 Average)

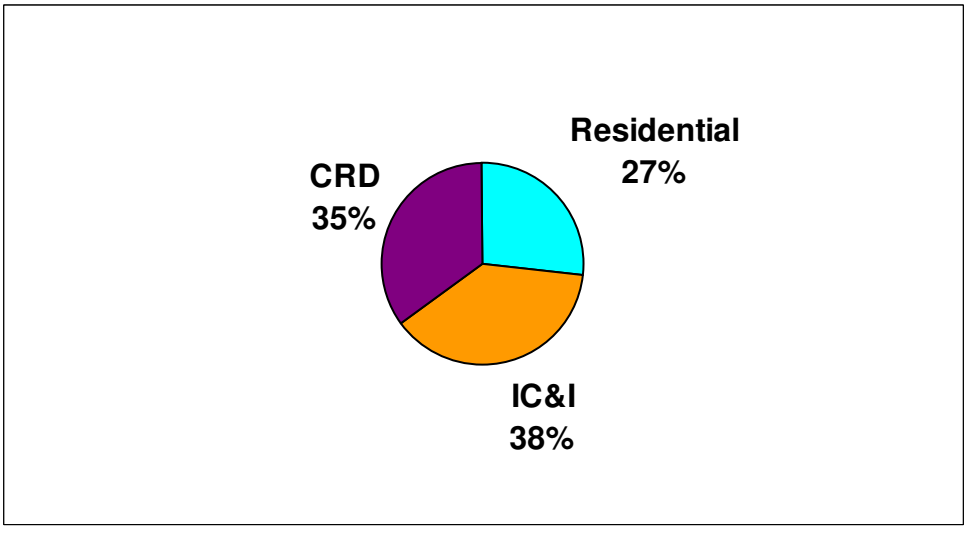


Table 3.3 further illustrates how RMWB waste disposal by sector compares with the provincial average using 2005 data.

TABLE 3.3
COMPARISON OF PER CAPITAL WASTE DISPOSAL BY SECTOR
2005

Sector	RMWB	Province	% Difference
	kg/capita		
Residential	361	331	9.1
IC&I	475	371	28
CRD	423	105	303

What Table 3.3 clearly illustrates is that residential waste disposal is similar to the provincial average but that IC&I and especially CRD waste disposal is much higher than the provincial average which drives up the overall per capita waste disposal.

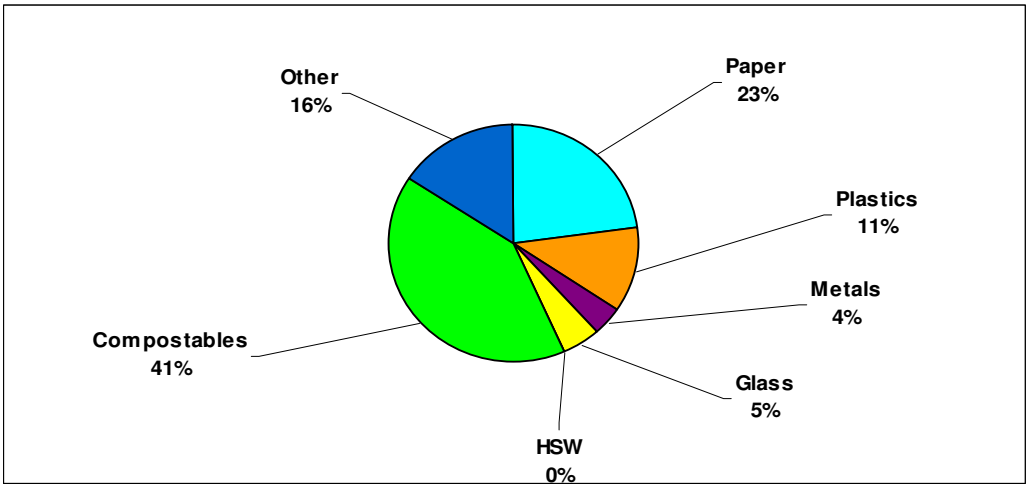
3.5 Waste Composition

The EBA 2004 report provides information on the waste characterization of Residential and IC&I waste in the RMWB, exclusive of wastes generated and managed on-site at oil sand sites. An estimate of CRD waste composition was made from available published data as no CRD waste characterization was undertaken specific to the RMWB. Appendix A summarizes the tonnes per year for each waste category within Residential and IC&I sectors based on waste composition data from the EBA 2004 report and the Municipal Solid Waste Options Report (MSW 2006), where available. The tonnages of waste for each category is based on the total Residential or IC&I tonnage disposed at the RMWB Regional Landfill in 2005. This total is multiplied by the percent of each category based on the EBA waste audit and or the Municipal Solid Waste Options report.

3.5.1 Residential

Figure 3.4 depicts the composition of the Residential waste.

FIGURE 3.4
COMPOSITION OF RESIDENTIAL WASTE RMWB
2005



Based on the waste composition data, Table 3.4 depicts the wastes that could be diverted from the Residential waste disposed at the RMWB landfill in 2005. Approximately **8,200** tonnes are available for recycling (36% of total residential waste) which does not account for what is presently diverted.

TABLE 3.4
TONNES OF RESIDENTIAL WASTE AVAILABLE FOR RECYCLING WITH EXISTING PROGRAMS

	Tonnes	Includes
Dry Recyclables		
Newspaper	1,434	
Cardboard (cardboard, boxboard, moulded pulp)	833	cardboard, boxboard, moulded pulp
Mixed Paper	3,077	computer paper, printed paper, magazines, notebooks, glossy paper, catalogues, greeting cards, non-foil gift wrap, paper bags, envelopes, phone books, hard and soft cover books
Sub-total Paper	**5,344**	
Plastic Milk Jugs	347	
Metals	902	tin cans, aluminium pie plates, drink cans
Glass	1,157	jars, bottles
Sub-total	**7,750**	
Landfill Diversion		
Landfill programs	**463**	Items including: Batteries, used oil and filters, anti-freeze and coolant, paint, propane tanks, tires, concrete and asphalt, e-waste, clean wood, yard waste and other organics), Appliances, Metals
Total Available	**8,212**	

The RMWB has a very modest leaf and yard waste composting program at the Regional Landfill. Organic wastes (i.e., food and leaf and yard waste) represent about 41% of the RMWB Residential waste stream, or about 9,500 tonnes (i.e., 3,000 tonnes leaf and yard and 6,500 tonnes food waste).

Approximately 80% of residential wastes are available for recycling or are candidates for an organics recycling program. Specifically, based on 2005 data, there is a total of 23,133 tonnes of residential waste disposed of which 8,212 can be diverted through a dry recycling program and 9,500 are organic and can be diverted via an organics recycling program. These values do not reflect what is currently diverted.

3.5.2 IC&I

Figure 3.5 depicts the composition of IC&I waste. Table 3.5 depicts the wastes that are available for existing waste diversion programs. Approximately 16,500 tonnes are available for recycling (54% of total IC&I waste).

FIGURE 3.5
COMPOSITION OF IC&I WASTE RMWB
2005

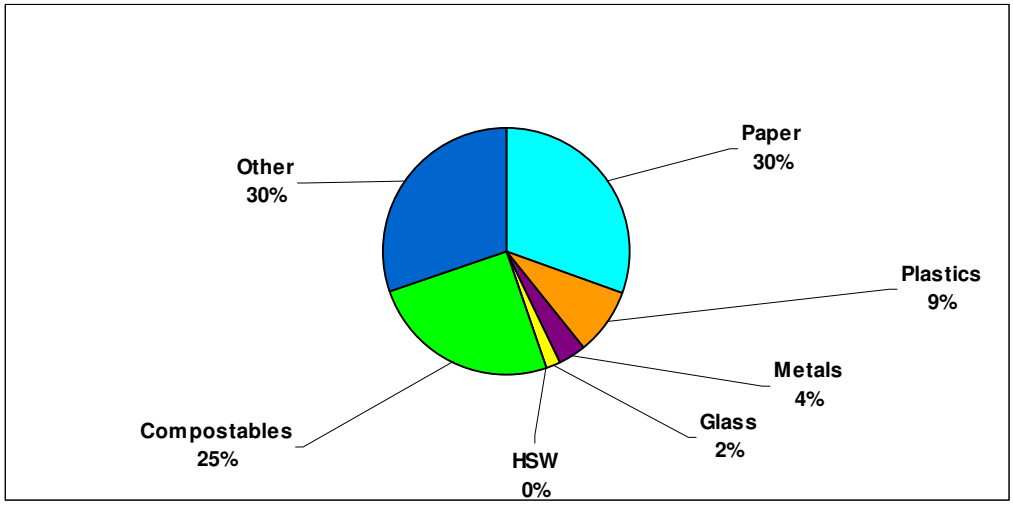


TABLE 3.5
TONNES OF IC&I WASTE AVAILBLE FOR RECYCLING WITH EXISTING PROGRAMS

Component	Tonnes	Includes
Dry Recyclables		
Newspaper	1,551	
Cardboard (cardboard, boxboard, moulded pulp)	2,311	cardboard, boxboard, moulded pulp
Mixed Paper	5,168	computer paper, printed paper, magazines, notebooks, glossy paper, catalogues, greeting cards, non-foil gift wrap, paper bags, envelopes, phone books, hard and soft cover books
Sub-total Paper	**9,029**	
Plastic Milk Jugs	0	
Metals	1,155	tin cans, aluminium pie plates, drink cans
Glass	547	jars, bottles
Sub-total	**10,732**	
Landfill Diversion		
Landfill programs	**5,746**	Items including: Batteries, used oil and filters, anti-freeze and coolant, paint, propane tanks, tires, concrete and asphalt, e-waste, clean wood, yard waste and other organics), Appliances, Metals
Total	**16,478**	

The RMWB has a very modest leaf and yard waste composting program at the Regional Landfill. Organic wastes (i.e., food and leaf and yard waste) represent about 25% of the RMWB IC&I waste stream, or about 7,600 tonnes (i.e., 1,000 tonnes leaf and yard and 6,600 tonnes food waste).

Approximately 80% of IC&I wastes are available for recycling or are candidates for an organics recycling program. Specifically, based on 2005 data, there is a total of 30,402 tonnes of IC&I waste disposed of which 16,478 can be diverted through a dry recycling program and 7,600 are organic and can be diverted via an organics recycling program.

3.5.3 CRD

No waste characterization studies of CRD waste have been undertaken in the RMWB. Figure 3.6 depicts the waste composition of CRD waste using Alberta Environment estimates. It is estimated that at least 18,150 tonnes, and probably more, are available for recycling, including rubble, aggregates and ceramics, metal and wood. There are existing diversion programs for these wastes at the Regional Landfill.

FIGURE 3.6
COMPOSITION OF CRD WASTE 2005
BASED ON PROVINCIAL INFORMATION

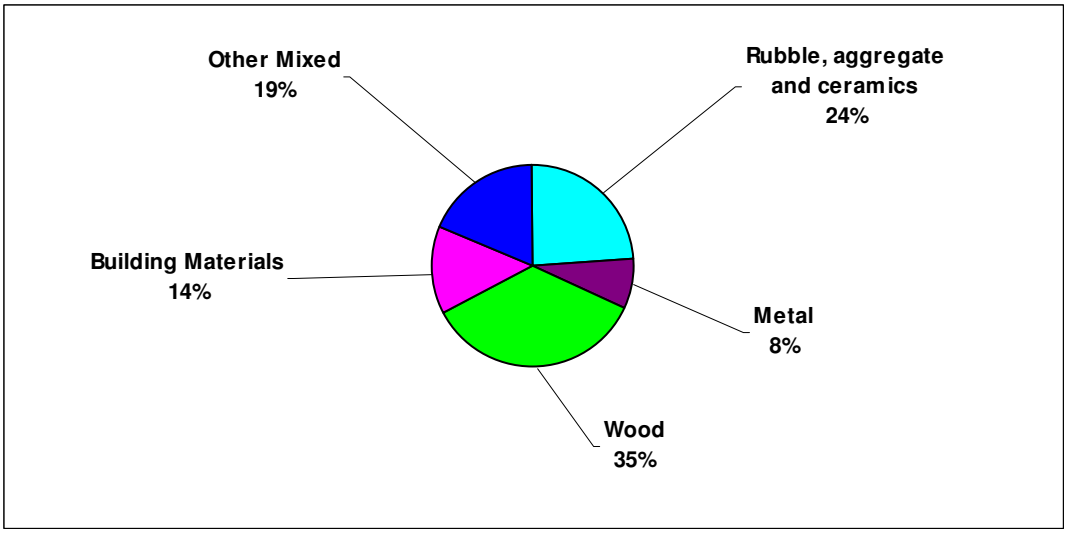


Table 3.6 depicts an estimate of the tonnages of various materials that would be typically available based on this Provincial information.

TABLE 3.6
ESTIMATE OF TONNAGES OF VARIOUS CRD WASTES

Component	%	tonnes/year
Rubble, aggregate and ceramics	24	4,356
Metal	8	1,452
Wood	35	6,352
Building Materials	14	2,541
Other Mixed	19	3,448
Total Available		18,150

It is likely that a significant portion of mixed building materials and other waste streams could be recycled. It is estimated that at least 70% of CRD waste is recyclable (based on a total of 27,089 disposed and a total of 18,150 available for recycling). Since it is the waste stream with the most fluctuation and contributes greatly to overall disposal, the CRD waste stream represents a significant opportunity for waste diversion.

3.6 Population Growth

The population and level of development activity are both increasing rapidly in the RMWB. It appears that population growth is exceeding that estimated in the Regional Infrastructure Plan (2003-2013) (Pitman, 2003). The Wood Buffalo Business Case 2005 predicted a projected urban

population growth of 45% through 2010 (i.e., six years starting with 2005). This would suggest a growth rate of about 6.25% per year.

From the data collected it is estimated that the urban population has increased approximately 27% from 2002 through 2005 or about 9% per year. The population grew an estimated 90% from 1999-2006.

From 2002 through 2005 waste disposal outpaced population growth on about a 3 to 1 basis (i.e., waste disposal increased 82% while population grew 27%).

As with other planning activities it is challenging to determine what the exact population growth will be. It appears that in many cases the amount of growth has been underestimated so it would be prudent to take a liberal approach when estimating population growth over time.

3.7 Future Waste Generation Estimates

Using 2005 waste disposal data (i.e., 80,624 tonnes) as a baseline various estimates of future waste generation per year were developed. Because waste diversion programs are currently modest waste disposal estimates can be used to estimate waste generation. These estimates assumed a 3:1 ratio between population growth and waste generation growth (high scenario). It should be noted that these wastes could be landfilled or subject to a waste diversion activity including reduction, recycling and composting.

Table 3.7 depicts a range of possible tonnages in the near future. The first column represents the actual disposal data for 2005 and the remaining columns are derived. Population growth is currently estimated to be 6 to 7% per year and it would appear that in the near future this will not change. What this demonstrates is that waste generation will continue to grow rapidly. If population growth continues at this pace (i.e., 6 to 7%) and waste generation growth continues at a 3:1 ratio to population growth, then by 2010 between about 185,000 to 210,000 tonnes of wastes requiring management will be generated (exclusive of wastes generated and managed onsite at oil sand sites).

TABLE 3.7
HIGH END ESTIMATES OF WASTE GENERATION VS POPULATION GROWTH
2006 THROUGH 2010

% Annual Population Growth	2005	2006	2007	2008	2009	2010
tonne/year disposal						
2	80,624	85,461	90,589	96,024	101,786	107,893
3	80,624	87,880	95,789	104,410	113,807	124,050
4	80,624	90,299	101,135	113,271	126,863	142,087
5	80,624	92,718	106,625	122,619	141,012	162,164
6	80,624	95,136	112,261	132,468	156,312	**184,448**
7	80,624	97,555	118,042	142,830	172,825	**209,118**
8	80,624	99,974	123,967	153,720	190,612	236,359
9	80,624	102,392	130,038	165,149	209,739	266,369
10	80,624	104,811	136,255	177,131	230,270	299,351

If population growth at 6 to 7% is assumed but the waste generation rate remains constant (i.e., also at 6 to 7%) then by 2010 between 108,000 to 113,000 tonnes of waste requiring management will be generated (i.e., exclusive of wastes generated and managed on-site at oil sand sites). Table 3.8 shows the range of tonnages that could be anticipated under this low estimate.

TABLE 3.8
LOW END ESTIAMTES OF WASTE GENERAITON VS POPULATION GROWTH
2006 THROUGH 2010

% Annual Population Growth	2005	2006	2007	2008	2009	2010
tonne/year disposal						
2	80,624	82,236	83,881	85,558	87,270	89,015
3	80,624	83,043	85,534	88,100	90,743	93,465
4	80,624	83,849	87,203	90,691	94,319	98,091
5	80,624	84,655	88,888	93,332	97,999	102,899
6	80,624	85,461	90,589	96,024	101,786	**107,893**
7	80,624	86,268	92,306	98,768	105,682	**113,079**
8	80,624	87,074	94,040	101,563	109,688	118,463
9	80,624	87,880	95,789	104,410	113,807	124,050
10	80,624	88,686	97,555	107,311	118,042	129,846

It is not expected that a high population growth rate will be sustained indefinitely although it is challenging to estimate average population growth into the long-term future. Oil sands production in the RMWB is currently estimated at one million barrels per day. It is expected to grow to three million barrels in 2020 and by 2030 up to 5 million barrels could be produced daily.

A significant part of current and expected future waste disposal and population growth is a function of oil sands project development. It is not expected that this will lead to a directly proportional increase in waste disposal as is depicted in Table 3.7, however, the equation to predict the waste disposal curve in the long-term is essentially unknown.

Using the 6% population growth scenario the RMWB can anticipate needing to handle anywhere between 110,000 and 190,000 tonnes of waste by 2010. This range of waste generation makes it difficult to plan for future infrastructure. Therefore it will be important to develop infrastructure that allows for easy expansion should waste quantities continue to grow. This would involve insuring that facilities are placed on large enough properties to facilitate expansion and that financial mechanisms allow for a flexible response to these infrastructure needs.

For the purposes of planning a mid-range generation of 150,000 tonnes should be used.

3.8 Landfill Gas Generation and Capture

There is significant potential for the RMWB to generate and capture landfill gas for energy generation, both at the existing and new lateral expansion regional landfills. In addition to the potential for energy generation these is also potential for creating and selling greenhouse gas emission reduction credits.

In 2006 the RMWB in conjunction with Shell Canada Limited and the Alberta Research Council commenced a two year feasibility study with respect to generating and capturing landfill gas. Fifty percent of the project cost is funded by the Federation of Canadian Municipalities (FCM). The work will result in a landfill gas generation database, estimates of the rates of generation of the gas, and feasibility of using the gas for electricity generation.

Based on the recommendations arising from this feasibility study, the administration will need to develop a comprehensive landfill gas management plan to reduce the emission of methane to the atmosphere from the existing and lateral expansion landfill sites. The plan will be developed in conjunction with the provincial and federal greenhouse gas emission reduction policies and legislation.

3.9 Assessment of Waste Management Systems in the Oil Sands Industry

In addition to the wastes currently handled (i.e., landfilled and recycled) by the RMWB a significant amount of waste is generated and managed within the oil sands projects. Five oil sands plants located in the RMWB were contacted and surveyed for information on their waste management programs. These companies were:

- Albian Sands Energy Inc.;
- Canadian Natural Resources Limited (Horizon Oil Sands Project);
- Nexen Inc.(Long Lake Project);
- Suncor Energy Inc.; and
- Syncrude Canada Ltd.

All except Nexen Inc. have on-site landfills for the disposal of solid non-hazardous wastes.

All plants have diversion programs that typically focus on dry recyclables such as cardboard, paper and metal. Albian Sands and Suncor have an extensive list of items that are recycled that include some liquid and hazardous wastes. Albian Sands also composts food wastes from their kitchen/cafeteria operations.

Table 3.9 summarizes the tonnages disposed and diverted from each of the five companies for 2004 and 2005 (Note: the most comprehensive information available was for 2005).

Overall about 46,000 tonnes of waste were disposed of in 2005, compared to 123,000 tonnes in 2004, from the five companies contacted. On-site waste disposal ranged from 0 to100% although overall 92% of wastes were disposed in on-site landfills in 2005. About 36,000 tonnes of wastes were recycled in 2005. The waste diversion rate ranged from 37 to 55% with an overall average of 44%.

Complete information provided by each plant is included in **Appendix B**. A brief summary of each plant is provided in Table 3.9.

TABLE 3.9
TOTAL TONNAGE DISPOSED AND DIVERTED FROM FIVE OIL SANDS PROJECTS

	Albian Sands Energy Inc.	Canadian Natural Resources Limited	Nexen Inc.[3]	Suncor Energy Inc.	Syncrude Canada Ltd.	Total
2004						
On-site Disposal	2,160	0	0	86,465	34,000	122,625
RMWB Disposal	310	0	0	0	0	310
Total	**2,470**	**0**	**0**	**86,465**	**34,000**	**122,935**
On-site (%)	**87**			**100**	**100**	**99**
Recycling	NA	NA	NA	NA	20,924	20,924
Diversion Rate	NA	NA	NA	NA	**38**	**15**
2005						
On-site Disposal	1,827	See Note[2]	0	9,447	31,000	42,274
RMWB Disposal	357	1,464	1,696	0	0	3,517
Total	**2,184**	**1,464**	**1,696**	**9,447**	**31,000**	**45,791**
On-site (%)	**84**	**0**	**0**	**100**	**100**	**92**
Recycling	2,100[1]	1,460	1,919	11,680[4]	18,390[5]	**35,549**
Diversion Rate	**49**	**50**	**53**	**55**	**37**	**44**

Diversion is calculated based on waste disposed at on-site and RMWB landfill.

1. Total recycled for Albian is approximated based on assumed densities. Quantity recycled excludes the mass of 34,800 pop can equivalents (pce).
2. For CNRL, 4800 Tonnes landfilled on-site reported in 2006 (to date). 3,802 Tonnes recycled in 2006(to date).
3. Nexen Inc. and CNRL were not operational in 2004 therefore there is zero waste generation in that year.
4. Suncor, quantities do not include waste routed through hazardous waste yard, waste disposed at tailings ponds. Some tonnages based on assumed densities.
5. Total recycled for Syncrude is approximated based on assumed densities. See Appendix B for recycled quantity and type breakdown.

Albian Sands Energy Inc. operates the Muskeg River Mine which is located 75 km north of Fort McMurray in the RMWB. This plant, at full production, produces 155,000 barrels of bitumen per day. The total waste annually disposed is approximately 2,000 tonnes at their on-site, class 3 landfill. About 400 tonnes/year was disposed at the Regional Landfill. In 2005, approximately, 2,000 tonnes of wastes was diverted through their recycling and composting programs. The diversion rate at Albian Sands is estimated at 49% for 2005.

Canadian Natural Resources Limited (Horizon Oil Sands Project) operates 70 km north of Fort McMurray. The company has a phased approach to production over a seven year period from 2005 to 2012. By 2008 they plan on producing 110,000 barrels per day of Synthetic Crude Oil (SCO). By 2012 the company hopes to produce 232,000 barrels per day. In 2005, at the start of their operations, they disposed about 1,500 tonnes at the Regional Landfill. To date (2006) the total waste disposed is approximately 4,800 at their on-site, class 2 landfill. The company recycles metal and CRD waste. The annual tonnage diverted through their programs is about 1,500 tonnes (2005). The diversion rate is estimated at 50% in 2005.

Nexen Inc. (Long Lake Project) is located 40 km southeast of Fort McMurray and 8 km Southeast of Anzac. Phase I includes the production of 70,000 barrels per day of bitumen. Presently, the company disposes all of its waste at the Regional Landfill. In 2005 they disposed about 1,700 tonnes and diverted 1,900 tonnes of metal. The diversion rate in 2005 is 53%.

Suncor Energy Inc. produced the first commercial barrel of SCO from the oil sands in 1967. By 2006, they produced their billionth barrel of SCO. The normal capacity for Suncor is 225,000 barrels per day. Based on 2005 values, the total waste annually disposed was approximately 9,450 tonnes at their on-site, class 2 landfill and they recycled 11,680 tonnes for a diversion rate 55%. In addition to its in-house waste diversion programs, Suncor and the Suncor Energy Foundation provide the RMWB with funding to develop a public education and awareness campaign on recycling and waste management.

Syncrude Canada Ltd. has produced over 1.6 billion barrels of crude oil since 1978. Currently they produce 240,000 barrels per day. The total waste annually disposed is approximately 31,000 tonnes (2005) at their on-site, class 2 landfill. They recycled 18,390 tonnes for a diversion rate of 37%.

In 2004 a total of approximately 144,000 tonnes of waste was handled (landfilled and recycled) by the 5 major companies with 81,000 tonnes being handled in 2005. Considering the significant amounts of waste generated at the oil sand sites it would make sense to explore the possibility of developing diversion infrastructure that could be utilized by the RMWB and the oil sands companies jointly.

4.0 WASTE REDUCTION STRATEGY

Recycled quantities data is incomplete. Based on available 2005 data the overall diversion rate was estimated to be 2.4% and the residential diversion rate was estimated to be 8%.

At the Waste Management Steering Committee meeting held November 14, 2006 it was decided to proceed with a 50% waste diversion goal across wastes generated in the Residential, IC&I and CRD sectors and managed at RMWB facilities. What this means is that for every 100 tonnes of waste generated at least 50 tonnes should be diverted. In broad terms for 2005 this means that just over 40,000 tonnes would have been landfilled and the same amount would have been diverted.

There are a number of different initiatives that could be undertaken in each of the three sectors to work towards achieving the waste diversion goal stated above. Table 4.1 presents a global overview (i.e., without segmenting urban and rural) of different possible waste diversion initiatives, an estimate of feasible (new) capture rates and a calculation of sector and overall diversion rates using the 2005 waste generation numbers. The possible waste diversion initiatives represent options and are described in some more detail in the following sections.

TABLE 4.1
OVERVIEW OF POSSIBLE WASTSE DIVERSION PROGRAMS BY SECTOR (2005)

Sector	Initiative	Available Tonnes	New Capture %	Possible Captured Tonnes	% Diversion Sector	% Diversion Overall
Residential	Enhanced Depot	7,800	10	780	3.4	1.0
	Enhanced Landfill Programs	500	20	100	0.4	0.1
	Enhanced Landfill Leaf and Yard Waste Program	3,100	30	930	4.0	1.2
	Curbside Recycling Program	7,800	50	3900	16.9	4.8
	Curbside Leaf and Yard Waste Program	3,100	80	2480	10.7	3.1
	Curbside Food Waste Program	6,400	50	3200	13.8	4.0
IC&I	Enhanced Depot	10,800	10	1080	3.6	1.3
	Enhanced Landfill Programs	5,800	20	1160	3.8	1.4
	OCC Collection	2,400	70	1680	5.5	2.1
	Fibre Collection	5,300	70	3710	12.2	4.6
	Food Waste Program	6,600	20	1320	4.3	1.6
CRD	Enhanced Rubble, Aggregate and Ceramics Recycling	6,600	90	5940	21.9	7.4
	Wood Recycling Program	9,500	70	6650	24.5	8.2
	Sorting Line	9,000	70	6300	23.3	7.8

For comparison purposes Table 4.2 provides the potential recyclables available in 2010 if population growth remains at 6% and waste generation outpaces population growth at the 3:1 ratio.

TABLE 4.2
OVERVIEW OF POSSIBLE WASTE DIVERSION PROGRAM BY SECTOR (2010)

Sector	Initiative	Available Tonnes	New Capture %	Possible Captured Tonnes	% Diversion Sector	% Diversion Overall
Residential	Enhanced Depot	9,800.0	10	980	4.2	0.9
	Enhanced Landfill Programs	600.0	20	120	0.5	0.1
	Enhanced Landfill Leaf and Yard Waste Program	3,900.0	30	1170	5.1	1.1
	Curbside Recycling Program	9,800.0	50	4900	21.2	4.5
	Curbside Leaf and Yard Waste Program	3,900.0	80	3120	13.5	2.9
	Curbside Food Waste Program	8,000.0	50	4000	17.3	3.7
IC&I	Enhanced Depot	14,400.0	10	1440	4.7	1.3
	Enhanced Landfill Programs	7,800.0	20	1560	5.1	1.4
	OCC Collection	3,100.0	70	2170	7.1	2.0
	Fibre Collection	7,100.0	70	4970	16.3	4.6
	Food Waste Program	8,900.0	20	1780	5.9	1.6
CRD	Enhanced Rubble, Aggregate and Ceramics Recycling	9,200.0	90	8280	30.6	7.7
	Wood Recycling Program	13,400.0	70	9380	34.6	8.7
	Sorting Line	12,600.0	70	8820	32.6	8.2

When designing diversion facilities the RMWB will have to take these future numbers into consideration.

4.1 Residential Options

Presently all RMWB waste diversion programs require residents to load these wastes into their vehicle and take them to another location, whether that be a depot or landfill. Residents have the option of bringing dry recyclables to a depot or landfill and to bring other wastes, generally those too awkward to place at the curb (e.g., white goods) to the landfill. Other items that can be brought to the landfill include: batteries, used oil and filters, anti-freeze and coolant, paint, propane tanks, tires, concrete and asphalt, e-waste, clean wood, yard waste and other organics), appliances, and metals.

4.1.1 Depot Model

Depots are used by many municipalities for the collection of recyclables and in some cases leaf and yard wastes.

This is a passive approach which has resulted in some modest success. The success of this type of program is limited by the resident's willingness to put these wastes in their car and take them to another place. A more active approach would consider installing some sort of curbside system to collect divertible wastes.

If the depot approach was used to enhance the RMWB residential waste diversion the following possible programs are envisioned:

- Enhanced depot recycling;
- Enhanced landfill recycling; and
- Enhanced leaf and yard waste depot.

It may be possible to further **enhance depot recycling** through additional depots, more frequent pick-ups and the continuation of the current communications and education (C&E) program. The DAGNY Partnership Report (2005) describes in detail action to improve capture rates at the depots. The depots captured 227 to 425 tonnes of recyclables in 2005 and 2006, respectively. Waste composition data reveals that there is an estimated further 7,700 tonnes/year in the waste stream that could be captured at the depots.

There are also opportunities for residents to bring various wastes to the landfill. Thus, it is possible to **enhance landfill recycling** and capture more waste with some additional and concerted C&E programs to encourage residents to bring these wastes to the landfill. Waste composition data reveals that there is 500 tonnes/year of this type of waste available for capture at the Regional Landfill.

There is a leaf and yard waste composting facility at the Regional Landfill. Presently incoming leaf and yard wastes are being mixed with soil and mounded on-site. An **enhanced leaf and yard waste composting program** could be considered. This would include the construction of a proper composting pad where leaf and yard wastes would be composted in a conventional manner (i.e., windrows, turn with loader). Furthermore, there appears to be limited C&E encouraging residents to bring these wastes to the landfill for composting. It is estimated that there is over 3,000 tonnes/yr (residential) available for a leaf and yard waste composting program.

4.1.2 Curbside Model

Presently only garbage is collected curbside. Curbside programs are used by many municipalities to collect dry recyclables, leaf and yard wastes and in some cases food wastes. It has been demonstrated with consistency that this approach results in significantly higher waste diversion rates than using a depot approach.

If this curbside approach was used to enhance the RMWB residential waste diversion program the following possible programs could be envisioned:

- Curbside recyclables collection;
- Curbside leaf and yard waste collection; and
- Curbside food waste collection.

Curbside recyclables collection would involve sending around a collection vehicle on a fixed schedule to collect whatever segment of the recyclable waste stream that was chosen. For instance for dry recyclables this could mean a weekly, bi-weekly or even a monthly collection schedule. Residents would set-out recyclables in a RMWB selected container (e.g., blue box, blue bag) and the recyclables collected would be sent to a Materials Recycling Facility (MRF).

Curbside leaf and yard waste collection could help facilitate the removal of a significant portion of leaf and yard waste from the landfill stream. This would be a seasonal collection (i.e., focused on spring and autumn) and would involve sending out a "packer" truck to collect leaf and yard wastes which would be sent to the landfill for composting.

A significant amount of food waste could be removed from the landfill stream through a **curbside food waste collection program**. This could involve the use of plastic curbside collection containers and a scheduled pick-up day. Residents would place allowable food wastes in the bin and set them out at the curb at the required time. Food wastes would be taken to a facility, with the appropriate composting technology, possibly at the landfill or sewage treatment plant, for composting.

In terms of collection vehicles it would be desirable to purchase vehicles with some flexibility (i.e., vehicles that could collect more than one stream simultaneously or separately).

4.2 IC&I Options

Presently much of the waste generated by the remaining IC&I sector (i.e., not including oil sands plants and camps) is being landfilled in the RMWB's disposal facilities. There appears to be minimal waste diversion programs targeted of the IC&I Sector.

There are a number of initiatives that could be used to enhance IC&I waste diversion including:

- Enhanced depot recycling;
- OCC collection;
- Paper collection; and
- Food waste collection.

More than 9,000 tonnes of the waste generated by the IC&I could be brought to the depots. While the focus of these depots appears to be residential waste it may be possible to **enhance depot recycling** to include IC&I waste.

It may be possible to institute a collection program(s) for the IC&I Sector either directly by the RMWB or through the private sector.

Cardboard (OCC) collection takes place in some municipalities outside the RMWB. It is generated in a considerable volume and represents an easy to divert waste stream. This would require a dedicated bin and truck system (e.g., front bins and truck; compactor and roll-off). There are more than 2,000 tonnes of OCC available a year for diversion.

Paper (i.e., newsprint, mixed papers) is generated in large quantities and thus it may be appropriate to put into place a mixed **paper collection** program. This would require a dedicated bin and truck system (e.g., front bins and truck; compactor and roll-off). There is approximately 5,000 tonnes of recyclable paper available a year for diversion.

A significant amount of food can be removed from the landfill stream through a **food waste collection program**. This type of program would target IC&I food waste generators. Carts and/or bins would be used to collect food wastes and they would be taken to a facility, possibly at the landfill or sewage treatment plant, for composting. This would be a more challenging system to put into place. There may be more than 6,500 available tonnes of food waste available a year.

4.3 CRD Options

The disposal of CRD waste is what is largely responsible for the fluctuations in waste disposal at RMWB facilities and is largely a function of construction project activities. CRD waste represents a significant opportunity to divert wastes through recycling since there is a significant opportunity to produce products that could largely be used locally.

The initiatives that could be used to enhance CRD waste diversion including:

- Enhanced landfill recycling; and
- Mixed CRD waste sorting.

There are significant opportunities to divert CRD wastes such as rubble, aggregate and ceramics (which include asphalt and concrete); metal and wood wastes which are readily recyclable. There are programs in place at the Regional Landfill.

It is possible to **enhance landfill recycling** of CRD wastes. Current programs could be enhanced so that more of these types of wastes can be captured and not landfilled. This could be facilitated

through the charging of a high tipping fee for mixed CRD loads and/or banning of certain materials. A preferential rate could also be given for segregated loads.

A significant portion of CRD wastes are recoverable and a **mixed CRD waste sorting** program could be implemented to maximize diversion and minimize disposal. Mixed loads could be sorted using a picking line and mechanical processing (e.g., trommel screen). It may be possible to incorporate this into the MRF and/or an outdoor CRD recovery facility.

In 2005 over 30,000 tonnes of CRD waste was disposed of at RMWB landfills, most of which is assumed to be available for diversion.

4.4 Stimulating Waste Diversion

While it is one thing to set waste diversion goals and implement programs it is another to stimulate sustained participation in these programs. Residents may be inclined to divert wastes because it is the "right thing to do" and "good for the environment" whereas business owners are more concerned about the bottom line. If a program costs more it is unlikely to gain traction.

There are a number of measures that could be put into place to stimulate waste diversion including:

- Bag limits;
- User pay;
- Landfill bans of certain wastes; and
- Financial incentives and penalties.

In general if one of these measures is put into place it is important to have sufficient initiatives or programs to capture wastes now destined for diversion.

The RMWB has instituted a **bag limit** of 4 bags/week for residents as per Bylaw 01/064. It may be possible to reduce this further in the future to stimulate recycling.

A **user pay** system means that residents receive or need to purchase tags which they attach to each outgoing bag of garbage. This makes residents mindful of the cost of disposal every time they put a bag at the curb.

These first two measures, bag limits and user pay, are not readily transferable to the IC&I or CRD Sectors, which typically use private sector contractors to collect and dispose of their waste. Waste management is a bottom line cost for them. Measures that restrict waste disposal or financial measures that provide an incentive or penalize could be used for these sectors.

Landfill bans of certain wastes can stimulate recycling in the residential as well as in the IC&I and CRD sectors. Obvious possible candidates for wastes to be banned include OCC, leaf and yard waste, wood, metal. Some other jurisdictions have banned other wastes including food wastes (e.g., Nova Scotia).

If a waste is readily recyclable then it is inefficient to dispose of it in landfill. It takes up valuable landfill space and reduces its life significantly. **Financial incentives and penalties** can be used to stimulate recycling. This can be done by quite simply making it less expensive than disposal. Conversely making landfilling more expensive, especially for certain wastes can stimulate diversion.

5.0 ALTERNATIVE WASTE MANAGEMENT SYSTEMS

Based on the analysis in Sections 2 through 4, five (5) possible waste management system scenarios have been developed. These systems are developed to be able to build upon each other, as each system is intended to increase the amount of waste being diverted from the landfill or different systems could be implemented independently. The five main systems are as follows:

System 1 – The status quo with enhanced depot operations;
System 2 – Increased leaf and yard waste collection and processing;
System 3 – Enhanced construction, renovation and demolition waste recycling;
System 4 – Residential Curbside collection and processing of dry recyclables; and
System 5 – Residential collection and processing of organics.

Each of the five main waste management systems is discussed in greater detail below. The five main systems as explained below relate to the urban centre. Specific suggestions for each of the rural centers are provided at the end of the section.

5.1 System 1 – The Status Quo with Enhanced Depot Operations

The status quo system is based on the existing waste management system that is operating in RMWB, however an enhanced depot system would be developed. The following components are included in System 1:

- Communications and Education (C&E) program;
- Curbside collection of garbage;
- Enhanced depot collection of recyclables;
- Beverage container recycling and milk jug recycling;
- Landfill diversion (batteries, used oil, anti-freeze, appliances, E-waste, clean wood, paint, propane tanks, tires);
- Landfill drop-off for leaf and yard waste composting; and
- CRD recycling at the landfill.

5.2 System 2 – Increased Leaf and Yard Waste Collection and Processing

This system would incorporate the same components as with System 1, however a curbside collection program for leaf and yard waste on a biweekly basis, from mid-May until mid-October, would be introduced in the municipality. The leaf and yard waste could be delivered to the facility being constructed at the sewage treatment plant and the finished product then delivered to the landfill for curing. The following components are included in System 2:

- Communications and Education (C&E) program;
- Curbside collection of garbage;

- Enhanced depot collection of recyclables;
- Beverage container recycling and milk jug recycling;
- Landfill diversion (batteries, used oil, anti-freeze, appliances, E-waste, clean wood, paint, propane tanks, tires);
- Landfill Drop-off leaf and Yard
- **Leaf and yard waste collection (10 times/yr/hhld during growing season); and**
- CRD recycling at the landfill.

5.3 System 3 – Enhanced CRD Recycling

In 2006 approximately 72,000 tonnes of asphalt and concrete was diverted at the landfill site. This represents a significant amount of waste and these materials can easily be reused within the municipality. In System 3 it is proposed to add to System 2 a CRD recycling facility at the landfill or another suitable location to turn CRD wastes into useful products.

The following components are included in System 3:

- Communications and Education (C&E) program;
- Curbside collection of garbage;
- Enhanced depot collection of recyclables;
- Beverage container recycling and milk jug recycling;
- Landfill diversion (batteries, used oil, anti-freeze, appliances, E-waste, clean wood, paint, propane tanks, tires);
- Leaf and yard waste collection (10 times/yr/hhld during growing season); and
- **Enhanced CRD recycling facility at the landfill or other suitable location.**

5.4 System 4 – Residential Curbside Collection and Processing of Dry Recyclables

System 4 incorporates the collection of dry recyclable materials at the curbside from households in the urban area and the use of depots in the rural centers. The materials to be collected would be dependant on the markets but could be similar to the existing depot program:

- Paper (newspaper, fine paper, etc);
- Cardboard;
- Tin and steel;
- Aluminum;
- Glass; and
- Plastics.

The following components are included in System 4:

- Communications and Education (C&E) program;
- **Residential curbside collection and processing of dry recyclables in urban areas;**
- Curbside collection of garbage;
- **Depot collection of dry recyclables in outlying (rural) areas;**
- Beverage container recycling and milk jug recycling;
- Landfill diversion (batteries, used oil, anti-freeze, appliances, E-waste, clean wood, paint, propane tanks, tires);
- Leaf and yard waste collection (10 times/yr/hhld during growing season); and
- Enhanced CRD recycling facility at the landfill or other suitable location.

The municipality has committed to build a MRF which will have the capacity to bale the materials collected and ship then to market.

5.5 System 5 – Residential Curbside Collection and Processing of Organics

System 5 includes the curbside collection and processing of the organic component of the waste stream. The processing could either be done at the composting facility to be constructed at the sewage treatment plant or a separate facility (i.e., landfill site). The following components are included in System 5:

- Communications and Education (C&E) program;
- Residential curbside collection and processing of dry recyclables;
- **Residential curbside collection and processing of organics;**
- Curbside collection of garbage;
- Depot collection of recyclables in outlying (rural) areas;
- Beverage container recycling and milk jug recycling;
- Landfill diversion (batteries, used oil, anti-freeze, appliances, E-waste, clean wood, paint, propane tanks, tires);
- Leaf and yard waste collection (10 times/yr/hhld during growing season); and
- Enhanced CRD recycling facility at the landfill or other suitable location.

More specific suggestions for the rural centres are provided below.

Fort Chipewyan

This is the most northerly Hamlet which only has road access in the winter. Establishing recycling programs in this Hamlet will be more difficult due to the remoteness. Dry recyclables could be stored in containers over the summer months and shipped in the winter to the MRF

constructed in Fort McMurray. A compost facility could be established at the landfill site for any organics programs implemented. With the implementation of each new system special consideration will have to be given to this area.

Other Hamlets

As each system is implemented the programs in each of the Hamlets, Anzac, Janvier and Conklin, will have to be investigated. Given that the landfill life in Janvier and Conklin is only 2 years, there is some urgency to put an alternate system into these communities. There is similar urgency in Anzac also given its rapid growth and demand for such service. It is envisioned that depots or transfer stations will be established at convenient locations in each Hamlet to service the population of the area. The feasibility of curbside collection would be investigated but only implemented if cost effective.

5.6 Mass Balance for Waste Management Systems

The waste quantities being captured by the various waste management systems will vary. The success of a waste diversion program is dependant primarily upon the participation of the residents and businesses that generate the waste and the political will to promote the programs.

The mass balance for each of the proposed waste management systems is included in **Appendix C**. The table outlines the quantity of waste that is expected to be handled by the various components of the waste systems identified for possible use by the RMWB. Each system builds on the next within the model although the impact of the added diversion component is shown for each the Residential, IC&I and CRD waste sectors. Table 5.1 summarizes the data.

TABLE 5.1
SUMMARY OF WASTE MANAGEMENT SYSTEM DIVERSION RATES (2005)

Component	System 1	System 2	System 3	System 4	System 5
Residential Waste diverted	**3,672 t**	**5,995 t**	**5,995 t**	**10,222 t**	**14,505 t**
Residential Diversion Rate	**14%**	**22%**	**22%**	**38%**	**54%**
IC&I Waste Diverted	**1,050 t**	**1,230 t**	**1,430 t**	**5,423 t**	**8,320 t**
IC&I Diversion Rate	**3%**	**4%**	**4%**	**17%**	**27%**
CRD Waste diverted	**0 t**	**0 t**	**19,400 t**	**19,400 t**	**19,400 t**
CRD Diversion Rate	**0%**	**0%**	**72%**	**72%**	**72%**
Total waste diverted	**4,722 t**	**7,425 t**	**26,825 t**	**35,045 t**	**42,225 t**
Overall Diversion Rate	**6%**	**9%**	**31%**	**41%**	**50%**

As shown in Table 5.1, the 2005 waste diversion rate for the RMWB was 6% or a total of 4,700 tonnes diverted out of 85,000 tonnes generated. If the municipality was to implement System 3 and add leaf and yard waste collection and composting the rate would increase to 9%. If CRD diversion is added in System 3 the overall rate would increase to 31%. If curbside collection of recyclables was added in System 4 the rate would increase to 41%. Finally, in System 5 if curbside collection and composting of organics was added the overall diversion rate would increase to 50%.

A number of broad assumptions were made to arrive at these predicted diversion rates but in general this is what could be anticipated using the 2005 waste data. The assumptions used are shown in Appendix C.

6.0 WASTE COLLECTION AND PROCESSING SYSTEMS

The collection and processing systems are an integral component of any waste management system. There are many collection and processing system options available to the municipality, depending on the waste diversion system chosen.

There are two main methods of collecting multiple waste streams. The various primary streams (i.e., recyclables, organics and garbage) can be collected separately in vehicles that pick up just one of the waste types at a time. This means that it is necessary for the collection vehicles to make numerous trips along each street in order to collect different waste streams. Another option is to collect more than one material type in a vehicle, thereby making another vehicle pass unnecessary but requiring more frequent trips to the end processing/disposal facility. When more than one type of waste stream is collected on a single vehicle it is referred to as co-collection. The collection of the different waste streams can be undertaken by physically picking the material from the curbs or using containers and an automated system of collection.

In this section, for each system configuration the different collection options available are highlighted and the possible processing options available for the collected wastes are discussed.

6.1 System 1 – Status Quo with Enhanced Depot Operations

Waste is currently collected on a weekly basis in the urban areas and all rural centers of the municipality. Waste is collected by municipal forces in Fort McMurray and contracted to private companies in the rural centers. Recyclables are delivered by residents to four depots located throughout the municipality and transport of the depot containers is contracted to the private sector. Processing of the recyclable material occurs at the landfill. Leaf and yard waste, tires, appliances, E-Waste, etc., can be delivered by residents and IC&I clients to the landfill site.

The municipality currently has 8 waste collection vehicles in its fleet.

Additions to the Status Quo would include the establishment of at least three additional depot sites to collect recyclables. In addition the purchase of a roll off truck to collect the containers from the existing and new recycling depots is being proposed. The recyclable material collected at the depots and landfill would continue to be processed as is currently undertaken.

6.2 System 2- Leaf and Yard Waste Collection and Processing

The change proposed in System 2 is the collection of leaf and yard waste biweekly throughout the growing season (i.e., May to October). Two additional trucks will be required to service the urban area of the municipality. Leaf and yard waste vehicles would be utilized on a weekly basis from May through October; however each household would receive collection on a biweekly basis. In the outlying areas, bins could be added to the depots for leaf and yard waste collection.

In addition, a open windrow composting pad would have to be constructed at the new regional landfill to accommodate the processing of the leaf and yard waste. The pad would be approximately 1 hectare in size.

6.3 System 3 – Enhanced CRD Recycling

The majority of the CRD waste will be delivered to the landfill from the private sector or residents directly hauling the material to the landfill site. Therefore, it is not anticipated that additional collection by the municipality will be required.

In this system the municipality would have to set up a CRD recycling facility. The most logical locations would be the existing landfill site or a new regional landfill location. This would involve setting up a CRD stockpiling area at the landfill site, selective sorting of the materials received, use of a grinder to grind the stockpiled CRD waste into useable products, screening of the processed material to improve quality as necessary, and establishment of a storage area for the useable products. This system would also require a loader and possibly conveyor belts.

6.4 System 4- Residential Curbside Collection and Processing of Dry Recyclables

In System 4 a curbside collection program and processing system for dry recyclables (i.e., fiber and container) would be added. Due to the number of materials collected, it will be necessary to commingle materials in the collection process. The typical materials collected are outlined in Table 6.1. The materials would then be separated at a Materials Recovery Facility (MRF).

TABLE 6.1
MATERIALS INCLUDED IN FIBER AND CONTAINER RECYCLING STREAMS

Fibers	Containers
Newsprint	PET Bottles
Office paper	Aluminum Cans and foil
Boxboard	Ferrous Cans
Corrugated Cardboard	Clear Glass
Paper cups and plates	Coloured Glass
Telephone Directories	Polystyrene Containers
Textiles	HDPE Bottles

Containers are typically placed in a blue box or blue bag, with fibers being placed in a second container or bag. Manual sorting by the driver is not required at the curbside, and there is not much opportunity for a truck to “cube out” (i.e., a “cube out” occurs when a co-collection vehicle has one of the compartments in the truck full, while the others have space remaining). The fiber and container waste streams can be collected in a two-compartment truck that is able to compact both streams.

Another option is to collect all the material in one box or bag with no sorting at the curb. This option would require significantly more sorting at the MRF. Because a number of the containers are collected in Stewardship programs the amount of containers would be reduced if the program is utilized. It is recommended that a dual recyclables stream (i.e.,. fibre and containers) system be used to reduce the amount of labour required at the MRF to sort materials. This would mean residents placing the fibre and container streams at the curb on the same week.

As part of this system a MRF would be required to sort the different recycling streams and bale the material for eventual shipment to market. A MRF is typically a large warehouse with a tipping floor to receive shipments of recyclables and conveyor belts for the recyclables to be transported through the separation system. Many automated technologies are available for some recyclable materials. Ferrous metals can be separated with a magnetic separator. Screening can be done to remove small pieces of glass and other waste that may contaminate streams. An eddy current separator uses an electromagnetic field to eject aluminum from a stream of mixed materials. Plastics can be separated with an air classifier, which takes advantage of the density differences of the materials. Manual sorting is typically utilized to separate the different polymers of plastic, different colours of glass and different grades of paper. An automated system greatly improves the economics of recycling by decreasing labour costs and increasing revenues through greater purity of the recovered materials.

6.5 System 5 – Residential Curbside Collection and Processing of Organics

System 5 requires the separation of an additional waste stream by the homeowner. As part of this system organic waste, such as meats, vegetable scraps, dairy products, etc. will be separated and sent for processing at a composting facility.

This system will require residents to potentially separate their waste into 4 streams for curbside collection on a regular basis:

- Fibers;
- Containers;
- Organics; and
- Garbage.

Leaf and yard waste could continue to be separated for collection on a bi-weekly basis throughout the growing season or combined with the other organics.

There are many combinations for collecting the various waste streams, but residents usually like to have their organics waste collected each week, since it is the most likely to cause odour problems. The waste stream co-collected with the organics is typically a function of the location of the MRF or landfill related to the organics processing facility. To encourage greater diversion a number of municipalities collect the waste stream every other week.

There are many different options for containers that residents can use to place the various waste streams at the curb. Some municipalities use different coloured see-through bags to differentiate containers, fibers and organic materials. Wheeled carts and various types of recycling boxes are other options. The important point is that residents be given clear instructions as to what containers they can use for each separate waste stream.

As part of this system a compost processing facility will be required. There are two main types of composting technologies available; non-reactor and reactor. Non-reactor systems take place in the open or outdoors and include the windrow and aerated static pile technologies. Reactor or in-vessel systems include the enclosed channel and tunnel/container systems such as is under construction for biosolids.

The municipality could build a facility to process the collected organics, utilize the composting facility to be constructed at the sewage treatment plant for biosolids or contract the processing to a private operator. The option chosen will have an impact on the collection system utilized.

7.0 CAPITAL COSTS FOR WASTE COLLECTION AND PROCESSING SYSTEMS

The total annualized costs for the five proposed waste management systems were developed herein to allow for a relative comparison amongst the various system options. The costs presented are in 2006 dollars, are preliminary in nature, should not be considered adequate for budgeting purposes and were calculated based on the following methodology:

- Capital costs for all equipment and buildings necessary to implement the system were estimated using data provided by RMWB, industry data and our experience;
- Financing charges for the capital expenditures were added to the capital costs using an interest rate of 6%; and
- The annualized capital costs were determined by allocating the capital costs over the expected life of the investment.

Table 7.1 outlines the expected life span for the various capital investments that will be necessary in order to implement the potential waste collection and processing options.

TABLE 7.1
EXPECTED LIFE SPAN OF CAPITAL INVESTMENT

Capital Investment	Expected Life Span
collection vehicles	**7 years**
buildings	**20 years**
processing equipment	**10 years**

The following sections provide information on the capital cost investment for each of the potential waste management systems.

7.1 System 1 – Status Quo and Enhanced Depot System

With System 1 it is proposed that three additional depots would be added throughout the municipality. The estimated capital costs for each depot site is $40,000. This cost is derived from the “Regional Municipality Wood Buffalo Five Year Recycling Project Plan 2005-2010”.

With the addition of the depots it is proposed that a roll off truck be purchased to service the sites. The estimated capital cost to purchase the truck would be $150,000.

Table 7.2 outlines the capital cost estimate for implementing the System 1 configuration.

TABLE 7.2
INCREMENTAL CAPITAL COST ESTIMATE FOR IMPLEMENTING SYSTEM 1

	Total Cost (2006$)	Service Life (YRS)	Interest Rate (%)	Annualized Cost (2006$)
Depot Sites (3)	**120,000**	**10**	**6**	**16,300**
Roll off truck (1)	**150,000**	**7**	**6**	**26,900**
		Total Annualized Cost		**43,200**

7.2 System 2 - Leaf and Yard Waste Collection and Processing

With System 2 a leaf and yard waste program would be introduced during the growing season (May to October) and material would be collected bi-weekly. It is anticipated that two (2) rear end packer trucks would be required for this operation. These trucks are estimated to cost between $150,000 and $180,000 each but for the sake of this analysis the trucks are estimated to cost $170,000 each. It is recommended that the leaf and yard waste be collected through a curbside program using paper bags. If plastic bags are used additional equipment will be required at the processing site to remove the plastic.

Based on the mass balance presented in Section 5.6 it is estimated that approximately 4,000 tonnes of leaf and yard waste could be collected at the curb. This Residential sector tonnage will be increased by 1,000 tonnes to account for additional wood waste from the IC&I sector that may be separated at the Regional Landfill site. Therefore a facility to accommodate 5,000 tonnes would be required. The equipment required to operate the facility would be a front end loader to turn the windrows and a trommel screen to screen the final product. The capital costs to construct the pad are estimated to be $400,000. It is assumed that equipment already at the landfill would be used to turn the windrows and a trommel would be rented as required once final maturation is complete.

Table 7.3 outlines the capital cost estimate for implementing the leaf and yard waste collection and processing infrastructure for System 2.

TABLE 7.3
INCREMENTAL CAPITAL COST ESTIMATE FOR IMPLEMENTING SYSTEM 2

	Total Cost (2006$)	Service Life (YRS)	Interest Rate (%)	Annualized Cost (2006$)
Yard Waste Collection Vehicles (2)	**340,000**	**7**	**6**	**61,000**
Compost Pad	**400,000**	**20**	**6**	**35,000**
		Total Annualized Cost		**96,000**

7.3 System 3 – Enhanced CRD Recycling

With System 3 the CRD waste would be delivered to the landfill by the IC&I and residential sectors as currently is the case. Therefore no additional trucks to collect the CRD waste are required. The major component of the CRD recycling process will be a grinder. The estimated costs of grinders range from $600,000 to $900,000, but for the sake of this analysis a cost of $800,000 has been used. In addition, a loader with a grapple hook would be required to load the waste into the grinder. The estimated costs of this equipment range from $250,000 to $300,000, but for the purpose of this analysis we have assumed a cost of $280,000.

Also, at least one conveyor will be required at an estimated cost of $60,000.

A pad to undertake the grinding operation at the site is also recommended and would cost approximately $400,000. Table 7.4 outlines the capital estimate for implementing the CRD infrastructure for System 3.

TABLE 7.4
INCREMENTAL CAPITAL COST ESTIMATE FOR IMPLEMENTING SYSTEM 3

	Total Cost (2006$)	Service Life (YRS)	Interest Rate (%)	Annualized Cost (2006$)
Grinder	**800,000**	**10**	**6**	**109,000**
Loader	**280,000**	**7**	**6**	**50,000**
Conveyor	**60,000**	**10**	**6**	**8,200**
CRD Pad	**400,000**	**20**	**6**	**35,000**
		Total Annualized Cost		**202,200**

7.4 System 4- Residential Curbside Collection and Processing of Recyclables

For the sake of this analysis the cost of implementing System 4 is based on the RMWB developing their own MRF to process recyclables. It may, however, be more economical for the RMWB to contract the collection and processing to the private sector. Cost estimates for a RWMB owned facility have been developed herein and can be used as a comparison with the cost of contracting to the private sector.

System 4 is based on the recycling program being expanded beyond the depots to include curbside collection, processing and sale, to secondary markets, of the container and fiber stream materials collected and processed.

It is recommended that the MRF be designed to accommodate at least 15,000 tonnes of material per year as this will help accommodate for future increases in tonnages.

Based on these assumptions, a MRF to process 15,000 tonnes of recyclables from the Residential and IC&I sector would cost approximately $7 million, of which $3 million would be for the building and $4 million for the equipment.

The RWMB would be required to provide residents with the appropriate containers to place the recyclable material in for collection. Two containers per/hhld is recommended (i.e., fibers and containers). Based on 20,000 households at $10/hhld the initial capital cost for containers would be about $400,000. The public needs to be engaged to adopt curbside recycling.

The collection of recyclables would be accomplished with side-loading co-collection (2 cubes) compaction vehicles. It is estimated that four collection vehicles would be required to cover the RMWB urban area. The cost of each co-collection vehicle is estimated at $190,000.

The estimated capital costs for implementing the recycling infrastructure for System 4 are outlined in Table 7.5.

TABLE 7.5
INCREMENTAL CAPITAL COST ESTIMATE FOR IMPLEMENTING SYSTEM 4

	Total Cost (2006$)	Service Life (YRS)	Interest Rate (%)	Annualized Cost (2006$)
Recycling collection Containers	**400,000**	**10**	**6**	**54,000**
Recycling collection vehicles (4)	**760,000**	**7**	**6**	**136,000**
MRF Building	**3,000,000**	**20**	**6**	**262,000**
MRF Equipment	**4,000,000**	**10**	**6**	**545,000**
	Total Annualized Cost			**997,000**

1. The RMWB has estimated the cost to construct a MRF at $3.2 million. The above cost is based on providing a MRF to handle over 15,000 tonnes of material with a significant amount of automation. The choice of MRF built will be a decision of the RMWB.

7.5 System 5 – Residential Curbside Collection and Processing of Organics

For the sake of this analysis the cost of implementing System 5 is based on the RMWB developing their own composting facility to process source separated organic (SSO) waste. It may, however, be more economical for the RMWB to send the collected source separated organics to the sewage treatment plant, or contract the collection and processing to the private sector. Cost estimates for an RWMB owned facility dedicated to source separated organics have been developed and can be used as a comparison with the cost of sending the material to the sewage treatment plant, or contracting to the private sector.

The System 5 configuration includes in-vessel composting of source separated organics. There are a number of in-vessel composting technologies that are currently being used in Canada, however most systems include some of the following basic components:

- Pre-processing equipment to remove contaminants from the organic feedstock;
- Channels or other types of containers where the composting takes place;
- Turning equipment to mix the organic feedstock during the composting process;
- A biofilter to remove odours from the exhaust air; and
- An outdoor curing pad.

It is recommended that an expandable facility be designed. The facility should be initially designed for approximately 10,000 tonnes of source separated organics. Based on other composting facilities of this size it is estimated that the total cost of the composting plant would be $3.5 million.

A trommel screen would be required at this size of facility with an estimated capital cost of $300,000.

The RWMB would be required to provide residents with the appropriate containers to place the organic material in for collection. Based on 20,000 households at $30/hhld the initial capital cost for containers would be $600,000.

The collection of organics would be accomplished with side-loading co-collection compaction vehicles. It is estimated that additional four collection vehicles would be required. The cost of each co-collection vehicle is estimated at $190,000.

The estimated capital costs to implement the infrastructure for the composting components of System 5 are outlined in Table 7.6.

TABLE 7.6
INCREMENTAL CAPITAL COST ESTIMATE FOR IMPLEMENTING SYSTEM 5

	Total Cost (2006$)	Service Life (YRS)	Interest Rate (%)	Annualized Cost (2006$)
Organics collection Containers	**600,000**	**10**	**6**	**82,000**
collection vehicles (4)	**760,000**	**7**	**6**	**136,000**
Compost Building	**2,000,000**	**20**	**6**	**175,000**
Compost Equipment	**1,500,000**	**10**	**6**	**205,000**
Trommel screen	**300,000**	**7**	**6**	**55,000**
	Total Annualized Cost			**653,000**

7.6 Summary

Based on the information presented in this section, the total annualized cost for capital expenditures for the components of each of the systems is as follows:

System 1 – Enhanced Depot -	$ 43,200
System 2 – Leaf and Yard Waste Composting -	$ 96,000
System 3 – CRD Recycling -	$202,200
System 4 – Recycling Collection and Processing -	$997,000
System 5 – Organics Collection and Composting -	$653,000

If the RMWB was to implement all the components of Systems 1 through 5 the total annualized cost for capital expenditures would be $1,991,400.

8.0 WASTE MANAGEMENT SYSTEM COSTS

This section outlines the financial model that was developed to determine the overall costs for the potential waste diversion systems being evaluated for the RMWB. This model takes into account the entire waste management system, including waste collected in the municipal pick-up, waste delivered to the landfill and other waste management facilities, and IC&I and CRD waste generation. The evaluation is based on the annual cost of each system in 2006 dollars.

The overall annual system cost consists of two components:

- The annualized capital costs for buildings and equipment; and
- The system operating costs.

The different costs of each component of a waste management system are outlined in the following sections.

To determine existing system costs the Rate Review & Analysis of the RMWB Water, Wastewater and Solid Waste Utilities Report prepared by Campbell Ryder Consulting Group in April 2006 was reviewed. For a point of comparison Table 8.1 outlines the actual costs reported in the Rate Review for waste management services between 2002 and 2004.

TABLE 8.1
ACTUAL WASTE MANAGEMENT SYSTEM COSTS
2002 TO 2004

Component	2002	2003	2004
Collection and Disposal	$1,613,541	$2,142,353	$2,118,159
Diversion	$95,738	$262,742	$255,900
Total Cost	$1,709,279	$2,405,095	$2,374,059
Tonnes	44,109	59,571	51,555
Cost Per Tonne	$39	$40	$46

The cost per tonne for the RMWB waste management system between 2002 and 2004 ranged from $39 to $46.

In order to assist in determining existing unit costs an average of the 2005, 2006, and 2007 forecasted costs from the Rate Review Report were reviewed. These are highlighted in Table 8.2.

TABLE 8.2
FORECASTED WASTE MANAGEMENT SYSTEM COSTS
2005-2007

Component	2005	2006	2007
Collection and Disposal	$2,833,373	$3,899,708	$4,547,509
Diversion	$492,939	$544,724	$717,961
Total Cost	$3,326,312	$4,444,432	$5,265,470
Tonnes	52,465	56,138	60,067
Cost Per Tonne	$61	$79	$88

As can be seen the costs were projected to increase significantly over the three year period. The costs are projected to increase because they include the costs to develop the new Regional Landfill. The actual waste management system costs realized in 2005 amounted to approximately $4,160,000 or $49 tonne using 85,000 tonnes of waste managed.

8.1 Cost of Disposal

It is necessary to consider the waste disposal component of the waste management system in order to evaluate the overall cost of each diversion system. The waste diversion system is a component of the overall integrated waste management system therefore the cost of any potential waste diversion system will be affected by the amount of waste that requires disposal.

The RMWB has recently received approval for a new landfill site. With the development of this site additional capital and operating costs will be incurred. In the 2006 Rate Review it was predicted that increases of 63% over the current landfill costs would occur as the new landfill comes into full operation. The 2006 Rate Review recommended an increase in tipping fees for the Residential, IC&I and CRD sectors as shown in Table 8.3.

TABLE 8.3
LANDFILL DISPOSAL RATES
2005-2007

Sector	2005 (tonne)	2005 Proposed (tonne)	2006 (tonne)	2007 (tonne)
Residential	**$21.12**	**$22.82**	**$37.15**	**$43.11**
IC&I	**$21.12**	**$22.82**	**$37.15**	**$43.11**
CRD	**$25.60**	**$27.56**	**$44.86**	**$52.06**

When looking at disposal costs the following items should be taken into account to determine the true costs of landfilling:

- Engineering and approvals costs;
- Compensation costs;
- Initial construction costs;
- Occasional and ongoing capital costs;
- Annual operating costs;
- Equipment replacement costs;
- Monitoring costs;
- Leachate management or natural attenuation costs;
- Landfill gas and odour management costs;
- Site closure and post closure costs;
- Buildings and equipment costs;
- Administrative costs;
- Interest costs; and
- Depreciation costs.

In MSW 2006 an evaluation of waste disposal costs for municipalities with populations of 20,000, 80,000 and 200,000 was undertaken where the above factors were taken into consideration. The calculations assumed a 20 year operation and a 50 year post closure period. The 2005 present value for a landfill for 80,000 people was $53/tonne.

An overall figure of $55 per tonne ($2006) is a reasonable cost for disposal, including both capital and operating costs, and was therefore used in the financial model.

8.2 The Financial Model

A financial model was developed specifically for the RMWB waste management system to determine the cost of each waste diversion system being considered. When the preferred waste management system is selected a business plan can be developed for a 25-year planning period.

The costs of the financial model are based on the following unit costs for the waste management system components.

8.2.1 Waste Collection (Residential)

The average assumed cost for curbside collection of waste from the 2006 Rate Review was $93 tonne. It is believed that this number is high based on our experience and therefore a cost of $70 tonne was used. It is recommended that the method of waste collection remain the same for all the potential waste management systems therefore the unit cost for waste collection will remain the same.

8.2.2 Landfill Diversion

The cost for the diversion of special materials (brush, tires, batteries, scrap metal, electronics etc.) from the landfill appears to be covered under the landfill operating costs and could not be broken out as a separate item. Therefore no cost for this item was placed in the model.

8.2.3 Waste Disposal

The 2006 Rate Review report includes a 2005 cost of $27.60 per tonne for the operation of the landfill site. The RMWB has received approval to operate a new landfill site once the existing site is full. As outlined in Section 8.1 the true cost of waste disposal is estimated to be $55 per tonne and this value was used in the analysis.

8.2.4 Communication and Education Program

All the proposed waste diversion systems will require a public education component to educate residents and business about the changes to the program. A figure of $150,000 per year was used in the model for public education. Currently the cost is included in the depot program. For Systems 4 and 5 an additional $100,000 will be required to provide additional education on the new systems.

8.2.5 Leaf and Yard Waste Collection

Leaf and yard waste is currently delivered to the site by residents. The estimated costs for a yard waste collection program are $70 per tonne which is the same as garbage collection.

8.2.6 Leaf and Yard Waste Processing

The estimated cost for the operation of a leaf and yard waste composting facility is $50 per tonne. This cost is based on costing information collected for similar programs.

8.2.7 CRD Recycling

If a full outdoors CRD facility was constructed the estimated cost to operate the facility is estimated at $45 per tonne. This cost is based on costing information collected for similar programs.

8.2.8 Recycling Collection and Processing

The RMWB depot recycling system cost was approximately $696,000 in 2005 and $567,000 in 2006. This represents a cost of $3,000 per tonne in 2005 and $1,300 per tonne in 2006. A cost of $900 per tonne was used in the analysis for Systems 1, 2 and 3 because of the purchase of a roll

off truck to collect the materials. The cost was dropped to $700 per tonne for Systems 4 and 5 to account for efficiencies related to the implementation of curbside collection.

If a blue box or bag program was implemented in System 4 the estimated costs per tonne for collection is $110 which is based on costs occurring for similar programs. The estimated cost to process the collected recyclables in a MRF is $110 per tonne based on costs occurring for similar programs.

8.2.9 Organics Collection

When organic collection programs are implemented an increase in unit collection costs of 10 to 20% above garbage collection costs result. This would result in a collection cost of approximately $110 per tonne using the $93 per tonne projected in the Rate Review.

8.2.10 Organics Processing

The estimated cost to processing the collected source separated organic material is $160 per tonne. This cost is based on costs report by other municipal programs. These costs may be reduced if the composting facility planned at the sewage treatment plant is utilized.

8.2.11 Recycling Revenues

The revenue received for recyclables varies because they are commodities sold on the open market. The revenue that could be received for the materials is estimated at $50 per tonne. This is based on revenue report by other programs.

8.2.12 Compost Revenues

The cost for the sale of compost is based on a market value of $25 per tonne.

8.3 Results of Financial Modeling

The cost of the existing waste management system in the RMWB was reported to be $39 to $46 per tonne between 2002 and 2004 or $1.7 to $2.4 million a year (see Table 8.1). Between 2005 and 2007 these costs where forecasted to increase to $88 per tonne or $5.3 million a year. In 2005 the actual costs for the waste management system were $4.2 million or about $1 million under the forecasted budget. In reality the RMWB handled approximately 85,000 tonnes in 2005 versus the forecast of 52,465 tonnes.

Appendix D contains the results of the financial analysis undertaken for the five waste management systems identified in this study. This analysis uses the 2005 tonnages as a base year for all systems and a tonnage handled of 85,346.

The total costs for each system are highlighted in Table 8.4

TABLE 8.4
COST OF PROPOSED WASTE MANAGEMENT SYSTEMS

System	Operating Cost ($)	Capital Cost ($)	Total System Cost ($)	Cost Per Tonne ($2006)
1.Status Quo and Enhanced Depot	6,510,000	40,000	6,550,000	77
2. Leaf and yard Waste	6,530,000	140,000	6,670,000	78
3. CRD Recycling	6,340,000	340,000	6,680,000	78
4. Recycling Collection and Processing	6,360,000	1,340,000	7,660,000	90
5. Organics Collection and Processing	6,580,000	2,000,000	8,500,000	100

As shown in Table 8.4 the total system costs will increase with the implementation of the proposed waste diversion programs. System 1 or the status quo is the cost assumed when the new landfill site is made operational and three new depots are added. If the new Regional Landfill was operational and the new depots were constructed the cost of the system would be $6.6 million or $2.4 million above the 2005 actual costs incurred to operate the existing landfill and depot system.

Therefore the 2006 cost difference to implement Systems 2 through 5 would be about $2.3 million.

9.0 SUMMARY AND CONCLUSIONS

9.1 General

The following general summary and conclusions are provided based on the analysis undertaken herein:

Regional Municipality of Wood Buffalo

- The recently approved Regional Landfill has capacity to handled approximately 20 million cubic metres of waste;
- The landfill sites operating in Conklin and Janvier will close in 2009 and 2008 respectively and alternative methods to handle this waste are required;
- Fort Chipewyan has adequate disposal capacity to handle its long term needs;
- The amount of waste requiring disposal in the RMWB has increased from 44,000 tonnes in 2002 to over 80,000 tonnes in 2005;
- Significant increase in the amount of waste generated are anticipated over the next few years and this could result in the need for the RMWB to handle between 110,000 and 190,000 tonnes of waste by 2010;
- The amount of material diverted from disposal in the RMWB ranged from 1,500 to 2,000 tonnes year between 2002 and 2005;
- The overall diversion rate for the RMWB was 3% in 2005 and the residential diversion rate was 14%;
- The RMWB has a significant amount of CRD waste that could easily be diverted from disposal;
- Potential synergies exist between the RMWB and the oil companies to develop waste diversion infrastructure that could be used by each party.

Oil Sands Projects

- The amount of total waste disposed on the oil sands sites studied ranged from 42,000 to 120,000 tonnes for 2004 and 2005;
- The amount of material diverted from the oil sands sites studied was 21,000 tonnes in 2004 and 36,000 tonnes in 2005; and
- The waste diversion rate achieved from the oil sands projects studied was 15% in 2004 and 44% in 2005.

9.2 Steering Committee Conclusion

During the Waste Management Steering Committee Meeting held November 14, 2006 it was decided to proceed with a 50% waste diversion goal across wastes generated in the Residential, IC&I and CRD sectors and managed by the RMWB.

If the RWMB wishes to achieve 50% diversion from landfill then System configuration 5 will have to be implemented, although this can be achieved progressively as Systems 1 through 5 can be implemented in a progressive manner. The System 5 configuration includes the following components:

- Communications and Education Program;
- Curbside collection and processing of recyclables;
- Curbside collection and processing of organics;
- Curbside collection of garbage;
- Depot collection of recyclables in outlying areas;
- Beverage container recycling and milk jug recycling;
- Landfill diversion (batteries, used oil, anti-freeze, appliances, E-waste, clean wood, paint, propane tanks, tires);
- Leaf and yard waste collection (10 times/yr/hhld during growing season); and
- Enhanced CRD Recycling facility at the landfill or other suitable location.

The diversion rates anticipated with implementation of the different components of each System is outlined in Table 9.1.

TABLE 9.1
WASTE MANAGEMENT SYSTEM DIVERSION RATES

Component	System 1	System 2	System 3	System 4	System 5
Residential Waste diverted	**3,672**	**5,995**	**5,995**	**10,222**	**14,505**
Residential Diversion Rate	14%	22%	22%	38%	54%
IC&I Waste Diverted	**1,050**	**1,230**	**1,430**	**5,423**	**8,320**
IC&I Diversion Rate	**3%**	**4%**	**4%**	**17%**	**27%**
CRD Waste diverted	**0**	**0**	**19,400**	**19,400**	**19,400**
CRD Diversion Rate	**0%**	**0%**	**72%**	**72%**	**72%**
Total waste diverted	**4,722**	**7,425**	**26,825**	**35,045**	**42,225**
OVERALL Diversion Rate	6%	9%	31%	41%	50%

9.3 Waste Systems Costs

The estimated costs associated with achieving the 50% diversion goal are highlighted in Table 9.2.

TABLE 9.2
COST OF PROPOSED WASTE MANAGEMENT SYSTEMS

System	Total Cost ($)	Cost Per Tonne ($2006)
1. Status Quo and Enhanced Depot	6,550,000	77
2. Leaf and yard Waste	6,670,000	78
3. CRD Recycling	6,680,000	78
4. Recycling Collection and Processing	7,660,000	90
5. Organics Collection and Processing	8,500,000	100

As can be seen in Table 9.2 the total system costs will increase with the implementation of the proposed waste diversion programs. System 1 or the status quo is the cost assumed when the new landfill site is made operational and three new depots are added. In other words the costs to provide waste services in 2005 were $4.2 million. If the new Regional landfill was operational and the new depots were constructed the 2005 cost of this system would be $6.6 million or $2.4 million above the 2005 costs.

Therefore the 2005 costs difference to implement Systems 2 through 5 would be $2.1 million.

9.4 Waste Management System Financial Recovery

In 2005 it cost the RMWB $4.16 million to provided waste disposal and diversion services to the residential and IC&I sectors. Only $2.14 million was recovered through user fees resulting in a deficit of $2 million. The fees charged to users needs to be examined to determine how to recover the costs of waste management.

10.0 RECOMMENDATIONS

10.1 General Recommendations

The following are general recommendations reached in the analysis:

- The RMWB should adopt a 50% diversion target from disposal for the Residential, IC&I and CRD sectors;
- Given the amount of capital expenditure required to provide the infrastructure to achieve the 50% target discussions with the provincial government and oil sands companies should be initiated to request additional funding support;
- If funding from Government and industry is not available then a diversion target of 25 % would be more realistic;
- The required diversion infrastructure must be developed and practical collection programs implemented in both urban centre of Fort McMurray with companion programs being provided in the rural centres;
- If curbside collection of dry recyclables is implemented in the urban centre the existing depot infrastructure could be transferred to the rural centres;
- As each different program is implemented a comprehensive education and communications program will need to be developed to inform the system users of the changes.
- The RMWB should provide core collection, recycling, composting and Landfilling services itself, relying on contractors to supplement the services during peak periods. This approach will provide the most reliable service.
- The RMWB should also review in detail its collection fleet and consider a more automated set of trucks for urban garbage collection at least.
- The key issue of truck access to collect garbage from multifamily buildings must be addressed to reduce the RMWB liability for damage to private property (vehicles and pavement in private parking lots). Collection from these buildings could be implemented once the property owners have agreed to an appropriate liability waver. Alternatively the property owners could contract the collection of garbage to others.
- In managing the landfill the RMWB should examine all alternatives for daily cover to find the most cost effective material that minimizes the volume used in the landfill. These alternatives may include excess construction fill, recycled construction and demolition waste, composted biosolids, synthetic covers and others which may become available in the future.
- As the Janvier and Conklin landfill sites close, new systems to handle and transport the waste will have to be developed.
- Finally, this master plan should be considered a “living document” and the municipality should continue to review and integrate the regional waste management system with other related initiatives in the region.

10.2 Waste Management Systems Recommendations

The following provides detailed recommendations on each of the five systems outlined in the report.

10.2.1 System 1 - Status Quo and Enhanced Depot

It is recommended that this system only be implemented in the urban area if the RMWB decides not to pursue System 4 – Recycling Collection and Processing. Regardless of the decision made on System 4 the municipality should consider purchasing a roll-off truck to service the existing depots. In addition, a facility to more economically process the collected recyclables is required.

Consideration should be given to the development of depots or transfer stations in the rural centers.

10.2.2 System 2 – Leaf and Yard Waste Collection

A biweekly leaf and yard waste program should be implemented in the urban areas of the RMWB in 2008. In order to implement this program the following is required:

- Expanded leaf and yard waste processing site;
- Purchase of two new trucks to collect leaf and yard waste from the curbside (consideration could be given to using existing older garbage trucks as they are replaced); and
- Decision on the type of collection container to be used to store the material before collection.

The compost pad at the existing landfill site could be expanded or a pad could be built at the new Regional Landfill. The estimated capital costs to construct the pad are $400,000 with the purchase of two new trucks estimated at $340,000.

In addition the RMWB would have to make a decision on the type of collection container to be utilized. It is recommended that Kraft paper bags and reusable garbage containers be allowed.

In the Rural Areas it is anticipated that less leaf and yard waste will be required to be manage because people will self manage this material. It is still recommended that a program be implemented in 2009 in the rural areas. This could include dedicated yard waste bins at recycling depots and closed landfill sites. This leaf and yard waste would need to be taken to the composting pad at the landfill.

10.2.3 System 3 - CRD Recycling

In addition to current diversion a significant amount of waste can be diverted from the CRD waste stream. A CRD recycling program should be implemented at the new Regional landfill. This would involve the establishment of a CRD storage and processing area at the site. This storage and processing area could be part of the new developed of the Regional landfill in 2008. It

is recommended that the storage and processing area be sized large enough to accommodate CRD material from the oil sands projects.

The processing of the stored CRD material could be undertaken by the RMWB or a private contractor.

The estimated cost to establish the CRD storage area is $400,000. A decision on purchasing equipment to process the material should not be made until it is determined what interest the private sector has in providing this service.

10.2.4 System 4 – Curbside Collection and Processing of Recyclables

The RMWB has committed to the development of a Materials Recycling Facility (MRF) at the new Regional landfill in 2008/2009. This facility will process, bale and make ready for market a number of different waste materials.

The oil sands companies should be approached to determine if they are interested in delivering their recyclables to the MRF. If they are interested then the annual quantities should be determined to assist with the sizing of the facility. In addition consideration should be given to the amounts of IC&I recyclables that may be delivered to the MRF for sizing purposes.

The most effective way to maximize recycling from the residents sector is to offer curbside collection of recyclables. The convenience of being able to place recyclable material at the curb significantly increases the amount of material that will be collected. It is recommended that with the construction of the MRF that the RMWB implement a curbside collection program first in the urban areas of Fort McMurray. An additional four trucks will be required to provide collection of recyclables.

A decision on the type of collection containers (blue box or bag) will also have to be made.

For the rural areas of the RWMB it is recommended that the feasibility of providing curbside collection be examined. This should be compared against depot or transfer stations options to determine which is most practical and cost effective.

10.2.5 System 5 – Curbside Collection and Processing of Organics

The RMWB will be developing an in-vessel composting system as part of the sewage treatment plant upgrades. In makes sense that this facility potential be expanded to accommodate organic wastes from the residential and IC&I sectors. The costs to develop two different facilities would be significant. It is recommended that the use of the compost facility being developed for

biosolids from the sewage treatment plant be utilized for organics from the residential and IC&I sector.

A curing area for organic wastes and biosolids will be required. It is recommended that this curing area be part of the infrastructure contemplated for the leaf and yard waste facility in System 2. It would require the construction of a larger pad at the Regional landfill. The equipment used for leaf and yard waste could be used to cure both organics and biosolids compost.

If the sewage treatment compost facility is not utilized a technology selection process would have to be conducted.

The oil sands companies should be approached to determine if they are interested in delivering their organics to the compost facility. If they are the quantities should be determined to assist with the sizing of the facility.

The most effective way to maximize organics diversion from the residents sector is to offer curbside collection. The convenience of being able to place organic material at the curb significantly increases the amount of material that will be collected. It is recommended that with the construction of the organics facility that the RMWB implement a curbside collection program first in the urban areas of Fort McMurray. Four split body trucks will be require for organics collection. A decision on the types of containers to collect the material will also have to be made.

10.3 Implementation Plan

The 50% diversion target was set by the Steering Committee at the beginning of the study. Using a 5 year planning window the following implementation plan is proposed to reach the target:

- Construct a MRF (2007/2008) and implement residential collection of dry recyclables (2008) in the urban and rural areas;
- Construct a leaf and yard waste compost pad at the Regional Landfill (2008) and collect leaf and yard waste from the urban and rural areas for delivery to the sewage treatment plant organics processing facility or the pad constructed at the Regional Landfill (2009);
- Construct an area at the Regional Landfill (2009) for the storage and processing of CRD wastes and tender to the private sector for processing or purchase appropriate equipment to process the material (2010);
- Construct an organics processing facility (2011) and implement organics collection in the urban and rural areas (2012).

With implementation of each program discussions should occur with the oil sands companies to determine their willingness to deliver wastes generated at their facilities to the Regional facilities. Sizing of the facilities should take into consideration waste generated in the IC&I sector. Discussions and detailed planning should also be conducted for each rural hamlet regarding siting options and other details to implement collection and recycling.

11.0 CLOSURE

A number of assumptions have been used throughout the report to arrive at the above conclusions. Changes in the assumptions used would impact the overall waste management system in the RMWB. These include:

- Population projections being higher or lower than those projected;
- Waste generation being higher or lower than projected;
- CRD generation being higher or lower than projected;
- Oil sands companies sending more of the on site waste generated to the RMWB disposal or diversion facilities;
- Establishment of a private sector disposal facility and the loss of IC&I and CRD waste to that facility;
- Increase in interest rates over the planning period;
- The general economy of the area slows down; and
- Residents, IC&I and CRD sectors not participating in diversion programs at the levels projected.

All costing is based on the concepts as described in the report and more detailed design of the systems is required.

Yours truly,

GOLDER ASSOCIATES LTD. **2cg Inc**

Michael Cant
Senior Solid Waste Planner

Paul van der Werf
President

MC/WJH/jh
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APPENDIX A

WASTE COMPOSITION ANALYSIS

Estimated Per Captia Residential Waste Generation (2005)

Population	**63,998**	**2005**	
Tonnage	**23,133**	**2005**	**t/yr**
kg/capita/yr	**361**		

		RESIDENTIAL (two data sources)					
	Waste sort categories and descriptions	**National Workshop Data 2006**			**EBA Waste Audits 2003**		
		%	**kg/capita/yr**	**t/yr**	**%**	**kg/capita/yr**	**t/yr**
1. PAPER FIBRES							
Newspaper	ONP, inserts	10.2	36.8	2,356.1	6.2	22.4	1,434
Magazines	OMG	2.8	10.1	649.1	1.7	6.1	393
Phone Books	OTB	0.1	0.5	30.8		0.0	0
Cardboard	OCC	3.8	13.8	881.5	3.6	13.0	833
Boxboard/Rolls	OBB	3.4	12.2	781.1		0.0	0
Mixed Papers	junk mail, fine household papers	3.5	12.8	819.8	2.9	10.5	671
Molded Pulp	egg cartons, drink trays	0.2	0.7	43.4		0.0	0
Books	hard and soft cover	0.3	1.0	62.3		0.0	0
Kraft Paper	paper bags	0.5	1.8	113.6		0.0	0
Spiral Wound	frozen juice, pringles type packaging	0.1	0.4	25.8		0.0	0
Tissue/Toweling	tissues, napkins, paper towels	1.5	5.4	347.7		0.0	0
Other Paper	multi-layered, waxed, wrapping, fast food	1.9	6.9	444.2	8.7	31.4	2,013
Gable Top Cartons	milk, juice	0.3	1.2	79.6		0.0	0
Aseptic Containers	tetra type packaging	0.0	0.2	10.7		0.0	0
	Sub-total Paper Fibres	**28.7**	**103.7**	**6,638.1**	**23.1**	**83.5**	**5,344**
2. PLASTICS							
PETE Soft Drink	# 1 soft drink	0.4	1.3	81.5	0.6	2.2	139
LCBO containers	alcholic beverage containers	0.2	0.7	46.5		0.0	0
PETE Other	water, juice, food, dish soap, trays	0.4	1.5	95.6		0.0	0
HDPE bottles	# 2	0.6	2.2	141.7	**1.5**	5.4	347
PVC	# 3, bottles, packaging	0.1	0.2	11.7		0.0	0
LDPE & PP Bottles	# 4 and # 5, squeezable	0.1	0.5	34.1		0.0	0
Wide Mouth Tubs & Lids	# 2, 4, 5 & 6	0.2	0.9	57.6		0.0	0
PS	# 6, trays, cups, packaging	0.7	2.6	165.4		0.0	0
Recyclable Film	shopping bags, milk pouches,	1.6	5.9	375.2		0.0	0
Non-Recyclable Film	garbage bags, chip bags, shrink wrap	1.5	5.6	356.8		0.0	0
Other Containers	# 7, trays, bottles, unmarked plastics	0.5	1.9	119.8		0.0	0
Other Plastics	non-pkg, garden hose, VCR tape, toys	1.4	4.9	315.0		0.0	0
	Sub-total Plastics	**7.8**	**28.1**	**1,801.1**	**11.4**	**41.2**	**2,637**
3. METALS		0.0	0.0	0.0		0.0	0
Aluminum Cans	food & beverage cans	0.8	2.8	176.9		0.0	0
Aluminum Foil Trays	pie plates, etc	0.2	0.6	37.1		0.0	0
Steel Cans	food & beverage cans	1.9	6.9	443.2		0.0	0
Other Metal	scrap metal, other containers, bikes	0.8	2.9	186.3		0.0	0
	Sub-total Metals	**3.6**	**13.2**	843.4	**3.9**	**14.1**	**902**

4. GLASS		0.0	0.0	0.0		0.0	0
Clear	food & beverage containers	3.4	12.3	786.5		0.0	0
Coloured	food & beverage containers	1.4	5.2	331.6		0.0	0
Other Glass	lightbulbs, window glass, cups, ceramics	0.5	1.7	111.6		0.0	0
	Sub-total Glass	**5.3**	**19.2**	**1,229.7**	**5**	**18.1**	**1,157**
5. HOUSEHOLD SPECIAL WASTES		0.0	0.0	0.0		0.0	0
Batteries	all types	0.1	0.3	17.3		0.0	0
Paint	paints (not empty)	0.2	0.6	38.5		0.0	0
Motor Oil	used oil, filters	0.0	0.1	4.7		0.0	0
Flammables	starter fluid, solvents	0.0	0.0	0.0		0.0	0
Aerosol Cans	empty	0.2	0.6	35.3		0.0	0
Paint Cans	empty	0.1	0.4	27.2		0.0	0
Other HSW	sharps, drugs, acids, antifreeze	0.3	1.0	61.7		0.0	0
	Sub-total HSW	**0.8**	**2.9**	**184.7**	**0**	**0.0**	**0**
6. COMPOSTABLES		0.0	0.0	0.0		0.0	0
Vegetable Food Waste	vegetable and fruit peelings	23.4	84.7	5,422.2	27.5	99.4	6,362
Animal Food Waste	meats, fats, oils	0.7	2.7	171.4		0.0	0
Grass	grass clippings	6.9	24.9	1,596.2		0.0	0
Woody Yard Waste	brush, branches, wood chips	1.0	3.6	230.3	12.6	45.5	2,915
Other Yard Waste	leaves, soil, garden wastes	3.5	12.5	801.0	0.5	1.8	116
Animal waste	feces, animal litter and bedding	2.2	7.9	503.9		0.0	0
Wood ashes	fireplaces & wood stoves	0.0	0.0	3.1		0.0	0
	Sub-total Compostables	**37.7**	**136.4**	**8,728.0**	**40.6**	**146.8**	**9,392**
7. OTHER WASTE MATERIALS		0.0	0.0	0.0		0.0	0
Textiles	clothing, shoes	3.4	12.2	782.2		0.0	0
Building Renovations	drywall, lumber, carpeting	2.7	9.8	626.7	2	7.2	463
White Goods	large appliances	0.5	1.7	108.0		0.0	0
Sanitary Products	diapers, napkins	6.2	22.5	1,442.1		0.0	0
Rubber	tires, mats, tubing	0.1	0.4	28.6		0.0	0
Furniture	sofas, chairs, cabinets	0.3	1.2	77.1		0.0	0
Electronics	televisions, radios, computers	0.4	1.4	92.5		0.0	0
Other	materials not classified elsewhere	2.3	8.4	538.0	13.9	50.2	3,215
	Sub-total Other Waste Materials	**16.0**	**57.7**	**3,695.1**	**15.9**	**57.5**	**3,678**
Grand Total		**99.9**	**361.3**	**23,120**	**99.9**	**361.1**	**23,110**

Estimated Per Household Residential Waste Generation (2005)

Population	**63,998**	**2005**	
Residential Waste	**23,133**	**2005**	**t/yr**
Households	**19,571**	**2005**	
kg/hshld/yr	**1,182**		

		RESIDENTIAL (two data sources)					
	Waste sort categories and descriptions	**National Workshop Data 2006**			**EBA Waste Audits 2003**		
		%	**kg/hshld/yr**	**t/yr**	**%**	**kg/hshld/yr**	**t/yr**
1. PAPER FIBRES							
Newspaper	ONP, inserts	10.2	120.4	2,356.1	6.2	73.3	1,434
Magazines	OMG	2.8	33.2	649.1	1.7	20.1	393
Phone Books	OTB	0.1	1.6	30.8		0.0	0
Cardboard	OCC	3.8	45.0	881.5	3.6	42.6	833
Boxboard/Rolls	OBB	3.4	39.9	781.1		0.0	0
Mixed Papers	junk mail, fine household papers	3.5	41.9	819.8	2.9	34.3	671
Molded Pulp	egg cartons, drink trays	0.2	2.2	43.4		0.0	0
Books	hard and soft cover	0.3	3.2	62.3		0.0	0
Kraft Paper	paper bags	0.5	5.8	113.6		0.0	0
Spiral Wound	frozen juice, pringles type packaging	0.1	1.3	25.8		0.0	0
Tissue/Toweling	tissues, napkins, paper towels	1.5	17.8	347.7		0.0	0
Other Paper	multi-layered, waxed, wrapping, fast food	1.9	22.7	444.2	8.7	102.8	2,013
Gable Top Cartons	milk, juice	0.3	4.1	79.6		0.0	0
Aseptic Containers	tetra type packaging	0.0	0.5	10.7		0.0	0
	Sub-total Paper Fibres	**28.7**	**339.2**	**6,638.1**	**23.1**	**273.0**	**5,344**
2. PLASTICS		0.0	0.0	0.0		0.0	0
PETE Soft Drink	# 1 soft drink	0.4	4.2	81.5		0.0	0
LCBO containers	alcholic beverage containers	0.2	2.4	46.5		0.0	0
PETE Other	water, juice, food, dish soap, trays	0.4	4.9	95.6		0.0	0
HDPE bottles	# 2	0.6	7.2	141.7		0.0	0
PVC	# 3, bottles, packaging	0.1	0.6	11.7		0.0	0
LDPE & PP Bottles	# 4 and # 5, squeezable	0.1	1.7	34.1		0.0	0
Wide Mouth Tubs & Lids	# 2, 4, 5 & 6	0.2	2.9	57.6		0.0	0
PS	# 6, trays, cups, packaging	0.7	8.5	165.4		0.0	0
Recyclable Film	shopping bags, milk pouches,	1.6	19.2	375.2		0.0	0
Non-Recyclable Film	garbage bags, chip bags, shrink wrap	1.5	18.2	356.8		0.0	0
Other Containers	# 7, trays, bottles, unmarked plastics	0.5	6.1	119.8		0.0	0
Other Plastics	non-pkg, garden hose, VCR tape, toys	1.4	16.1	315.0		0.0	0
	Sub-total Plastics	**7.8**	**92.0**	**1,801.1**	**11.4**	**134.7**	**2,637**
3. METALS		0.0	0.0	0.0		0.0	0
Aluminum Cans	food & beverage cans	0.8	9.0	176.9		0.0	0
Aluminum Foil Trays	pie plates, etc	0.2	1.9	37.1		0.0	0
Steel Cans	food & beverage cans	1.9	22.6	443.2		0.0	0
Other Metal	scrap metal, other containers, bikes	0.8	9.5	186.3		0.0	0
	Sub-total Metals	**3.6**	**43.1**	843.4	**3.9**	**46.1**	**902**

4. GLASS		0.0	0.0	0.0		0.0	0
Clear	food & beverage containers	3.4	40.2	786.5		0.0	0
Coloured	food & beverage containers	1.4	16.9	331.6		0.0	0
Other Glass	lightbulbs, window glass, cups, ceramics	0.5	5.7	111.6		0.0	0
	Sub-total Glass	**5.3**	**62.8**	**1,229.7**	**5**	**59.1**	**1,157**
5. HOUSEHOLD SPECIAL WASTES		0.0	0.0	0.0		0.0	0
Batteries	all types	0.1	0.9	17.3		0.0	0
Paint	paints (not empty)	0.2	2.0	38.5		0.0	0
Motor Oil	used oil, filters	0.0	0.2	4.7		0.0	0
Flammables	starter fluid, solvents	0.0	0.0	0.0		0.0	0
Aerosol Cans	empty	0.2	1.8	35.3		0.0	0
Paint Cans	empty	0.1	1.4	27.2		0.0	0
Other HSW	sharps, drugs, acids, antifreeze	0.3	3.2	61.7		0.0	0
	Sub-total HSW	**0.8**	**9.4**	**184.7**	**0**	**0.0**	**0**
6. COMPOSTABLES		0.0	0.0	0.0		0.0	0
Vegetable Food Waste	vegetable and fruit peelings	23.4	277.0	5,422.2	27.5	325.0	6,362
Animal Food Waste	meats, fats, oils	0.7	8.8	171.4		0.0	0
Grass	grass clippings	6.9	81.6	1,596.2		0.0	0
Woody Yard Waste	brush, branches, wood chips	1.0	11.8	230.3	12.6	148.9	2,915
Other Yard Waste	leaves, soil, garden wastes	3.5	40.9	801.0	0.5	5.9	116
Animal waste	feces, animal litter and bedding	2.2	25.7	503.9		0.0	0
Wood ashes	fireplaces & wood stoves	0.0	0.2	3.1		0.0	0
	Sub-total Compostables	**37.7**	**446.0**	**8,728.0**	**40.6**	**479.9**	**9,392**
7. OTHER WASTE MATERIALS		0.0	0.0	0.0		0.0	0
Textiles	clothing, shoes	3.4	40.0	782.2		0.0	0
Building Renovations	drywall, lumber, carpeting	2.7	32.0	626.7	2	23.6	463
White Goods	large appliances	0.5	5.5	108.0		0.0	0
Sanitary Products	diapers, napkins	6.2	73.7	1,442.1		0.0	0
Rubber	tires, mats, tubing	0.1	1.5	28.6		0.0	0
Furniture	sofas, chairs, cabinets	0.3	3.9	77.1		0.0	0
Electronics	televisions, radios, computers	0.4	4.7	92.5		0.0	0
Other	materials not classified elsewhere	2.3	27.5	538.0	13.9	164.3	3,215
	Sub-total Other Waste Materials	**16.0**	**188.8**	**3,695.1**	**15.9**	**187.9**	**3,678**
Grand Total		**99.9**	**1,181.3**	**23,120**	**99.9**	**1,180.8**	**23,110**

Estimated Per Captia IC&I Waste Generation (2005)

Population	**63,998**	**2005**	
IC&I Waste	**30,402**	**2005**	**t/yr**
kg/capita/yr	**475**		

		IC&I		
	Waste sort categories and descriptions	**EBA Waste Audits 2003**		
		%	**kg/capita/yr**	**t/yr**
1. PAPER FIBRES				
Newspaper	ONP, inserts	5.1	24.2	1,551
Magazines	OMG		0.0	0
Phone Books	OTB		0.0	0
Cardboard	OCC	7.6	36.1	2,311
Boxboard/Rolls	OBB		0.0	0
Mixed Papers	junk mail, fine household papers	4.7	22.3	1,429
Molded Pulp	egg cartons, drink trays		0.0	0
Books	hard and soft cover	0.6	2.9	182
Kraft Paper	paper bags	0.2	1.0	61
Spiral Wound	frozen juice, pringles type packaging		0.0	0
Tissue/Toweling	tissues, napkins, paper towels		0.0	0
Other Paper	multi-layered, waxed, wrapping, fast food	12.3	58.4	3,739
Gable Top Cartons	milk, juice		0.0	0
Aseptic Containers	tetra type packaging		0.0	0
	Sub-total Paper Fibres	**30.5**	**144.9**	**9,273**
2. PLASTICS			0.0	0
PETE Soft Drink	# 1 soft drink		0.0	0
LCBO containers	alcholic beverage containers		0.0	0
PETE Other	water, juice, food, dish soap, trays		0.0	0
HDPE bottles	# 2		0.0	0
PVC	# 3, bottles, packaging		0.0	0
LDPE & PP Bottles	# 4 and # 5, squeezable		0.0	0
Wide Mouth Tubs & Lids	# 2, 4, 5 & 6		0.0	0
PS	# 6, trays, cups, packaging		0.0	0
Recyclable Film	shopping bags, milk pouches,		0.0	0
Non-Recyclable Film	garbage bags, chip bags, shrink wrap		0.0	0
Other Containers	# 7, trays, bottles, unmarked plastics		0.0	0
Other Plastics	non-pkg, garden hose, VCR tape, toys		0.0	0
	Sub-total Plastics	**8.5**	**40.4**	**2,584**

3. METALS			0.0	0
Aluminum Cans	food & beverage cans		0.0	0
Aluminum Foil Trays	pie plates, etc		0.0	0
Steel Cans	food & beverage cans		0.0	0
Other Metal	scrap metal, other containers, bikes		0.0	0
	Sub-total Metals	**3.8**	**18.1**	**1,155**
4. GLASS			0.0	0
Clear	food & beverage containers		0.0	0
Coloured	food & beverage containers		0.0	0
Other Glass	lightbulbs, window glass, cups, ceramics		0.0	0
	Sub-total Glass	**1.8**	**8.6**	**547**
5. HOUSEHOLD SPECIAL WASTES			0.0	0
Batteries	all types		0.0	0
Paint	paints (not empty)		0.0	0
Motor Oil	used oil, filters		0.0	0
Flammables	starter fluid, solvents		0.0	0
Aerosol Cans	empty		0.0	0
Paint Cans	empty		0.0	0
Other HSW	sharps, drugs, acids, antifreeze		0.0	0
	Sub-total HSW	**0**	**0.0**	**0**
6. COMPOSTABLES			0.0	0
Vegetable Food Waste	vegetable and fruit peelings	21.6	102.6	6,567
Animal Food Waste	meats, fats, oils		0.0	0
Grass	grass clippings		0.0	0
Woody Yard Waste	brush, branches, wood chips		0.0	0
Other Yard Waste	leaves, soil, garden wastes	3.4	16.2	1,034
Animal waste	feces, animal litter and bedding		0.0	0
Wood ashes	fireplaces & wood stoves		0.0	0
	Sub-total Compostables	**25**	**118.8**	**7,601**
7. OTHER WASTE MATERIALS			0.0	0
Textiles	clothing, shoes		0.0	0
Building Renovations	drywall, lumber, carpeting	18.9	89.8	5,746
White Goods	large appliances		0.0	0
Sanitary Products	diapers, napkins		0.0	0
Rubber	tires, mats, tubing		0.0	0
Furniture	sofas, chairs, cabinets		0.0	0
Electronics	televisions, radios, computers		0.0	0
Other	materials not classified elsewhere	11.3	53.7	3,435
	Sub-total Other Waste Materials	**30.2**	**143.5**	**9,181**
Grand Total		**99.8**	**474.1**	**30,341**

APPENDIX B

WASTE MANAGEMENT SYSTEMS IN THE OIL SANDS INDUSTRY

Assessment of Waste Disposal and Waste Diversion - Industry

Company Contact	Landfill On-Site Type of On-site Landfill Tonnes disposed On-Site	Tonnage Disposed at RMWB Landfill	Waste Audit	Recycling Program	Items Recycled End of Market and Location	Tonnes Recycled [2] Revenue Cardboard Baled?	Other Recycling and Composting Initiatives
	WASTE DISPOSAL		**WASTE DIVERSION**				
Albian Sands Energy Inc. Samantha James Senior Environmental Specialist (780) 714-5233 Samantha-james@albiansands.ca	• Landfill on-site • Class 3 • Tonnes landfilled: 2,160 (2004), 1,827 (2005), 2,160 (2006, as of end of October)	• 310 (2004) 357 (2005) 412 (2006)	No	There is a recycling program	• Cardboard ,Paper • Pop Cans and Bottles • Ink and Toner Cartridges • Rechargeable Batteries • Eyeglasses • Hearing Aids • Cell Phones and Pagers • Electronic Waste • Fluorescent Bulbs • Vehicle Batteries • Passenger Tires • Oil, Oil Filters, Oil Plastics • Oily Rags • Aerosols • Glycol • Flammable Liquids • Paint • Scrap Metal • Plastic Drums **Markets** • Cardboard and Paper - Metro Waste Paper, Edmonton • Metal - AMIX, Vancouver, BC • E-Waste - E-Cycle Solutions, Airdrie, AB • Beverage containers - Ft. McMurray Bottle Depot • Oil - EIL, subcontracted through Hazco • Revenue is obtained for all recyclables.	• Cardboard – 26 (2005), 44 (2006) • Paper – 12 (2005), 14 (2006) • Metal – 1,325 (2005) • E-Waste - 1 Tonne to date. Approx. 8-10 tonnes to be shipped • Beverage containers - 34,800 pce[1] (2005), 69,000 pce (to date, 2006) • Oil – 867,000 L (2005) 915,000 L (2006)	• Organics collection (kitchen waste of 200-300 lb per week) and on-site composting • Pilot project includes recovery of recyclables, compostables, from landfill • Education program for employees on recycling

Company Contact	Landfill On-Site Type of On-site Landfill Tonnes disposed On-Site	Tonnage Disposed at RMWB Landfill	Waste Audit	Recycling Program	Items Recycled End of Market and Location	Tonnes Recycled [2] Revenue Cardboard Baled?	Other Recycling and Composting Initiatives
	WASTE DISPOSAL		**WASTE DIVERSION**				
Canadian Natural Resources Limited Shayela Chowdhury Regulatory Coordinator (780) 828-2771 Shayela.chowdhury@cnrl.com	• Landfill on-site • Class 2 Tonnes landfilled: 4,800 to date (2006)	• 1,464 (2005)	A waste audit was not conducted.	There is a recycling program	• Metal • C&D	• Metal – 60 (2005), 938 (2006) • C&D – 1,404 (2005), 2,865 (2006)	No
Nexen Inc. Jim Macpherson Jim_macpherson@nexeninc.com (403) 699-5033	• No landfill on-site. • Will apply for Class 2.	1,696 (2005)	A waste audit was conducted.	There is a recycling program	• Cardboard • Metal • Wood Cardboard and metal go to Edmonton.	• Metal – 1919 (2005) • Cardboard is baled.	No

Company Contact	Landfill On-Site Type of On-site Landfill Tonnes disposed On-Site	Tonnage Disposed at RMWB Landfill	Waste Audit	Recycling Program	Items Recycled End of Market and Location	Tonnes Recycled [2] Revenue Cardboard Baled?	Other Recycling and Composting Initiatives
	WASTE DISPOSAL		**WASTE DIVERSION**				
Suncor Energy Inc. Karim Zariffa Sustainable Development Associate (780) 713-2756 kzariffa@suncor.com	• Landfill on-site • Class 2 • Tonnes landfilled: 86,465 (2004) • Tonnes landfilled 9447 (2005) does not include hazardous waste stream		A waste audit was conducted.	There is a recycling program	• Batteries (lead acid, Ni-Cd, alkali and rechargeable) • Paint and Paint products • Rubber Tires • Paper • Photocopier toner cartridges • Electronic Equipment • Used oil • Spent Parts, washer fluids • Spent Glycol (MEM) • Steel • Plastic Chemical/ Oil Barrels • Steel Barrels • Used Oily Rags • Beverage containers at camp • Scrap metal <u>Recycled Off Site</u> End of market: Newalta corporation, Edmonton recycling, Sunset Salvage Fort McMurray, Environmental Rubber Products, Great West Container, Edmonton, Exide Technologies, Edmonton. <u>One-time off site recycled</u> Gulf Chemical and Metallurgical Corp, Earthtech Canada – Swan Hills Treatment Centre, Clean Harbors – Riley, Hazco	<u>Recycled off site</u> Used oil – 262 Used oil filters – 71 Spent parts washer fluid – 37 Paper – 18 Steel – 8,535 Used tires – 1, 265 Glycol – 37 Plastic barrels – 6 Lead acid batteries – 40 <u>One-time off site recycled</u> Spent hydrotreater catalyst – 49 Spent sulfatreat catalyst – 230 Spent zinc oxide – 26 Spent super claus catalyst – 42 Flowmore EC5375A – 6 Used oil – 14 <u>Recycled on-site</u> Firebag drilling mud – 385 Used oil from above ground storage tanks - 660	• Working toward formalizing a program in 2007

Company Contact	Landfill On-Site Type of On-site Landfill Tonnes disposed On-Site	Tonnage Disposed at RMWB Landfill	Waste Audit	Recycling Program	Items Recycled End of Market and Location	Tonnes Recycled [2] Revenue Cardboard Baled?	Other Recycling and Composting Initiatives
	WASTE DISPOSAL		**WASTE DIVERSION**				
					Transfer station, Calgary		
Syncrude Canada Ltd. John Ellingsen (780) 790- 5339 ellingsen.john@syncrude.com	• Landfill on-site • Class 2 • Tonnes landfilled: 34,000 (2004), 31,310 (2005)	Insignificant	A waste audit was conducted.	There is a recycling program	• Cardboard • Paper • Metal • E-Waste	• Cardboard [2] - 10 (2004), 58 (2005) • Metal – 11,204 (2004), 7,710 (2005) • E-Waste – 8 (2004), 14 (2005) • Revenue is obtained for cardboard and paper • Cardboard is bailed.	Additional substances or items recycled include (quantities approximate and reflect 2005 quantities): •Aerosol – 5 tonnes •Lead acid batteries – 70 tonnes •Catalyst – 6000 tonnes •Waste flammable recycled on-site – 130 m^3 •Used lubricants – 500 m^3 re-used for dust control and 2500 m^3 recycled on-site. •Used oil and fuel filters – 80 tonnes •Glycol – 130 m^3 re-used on-site. •Rags – reused – 3 tonnes •Rubber recycle and reuse – 1500 tonnes •Drums – 20 tonnes •Kitchen grease – 10 tonnes Pop/juice containers – 12 tonnes.

Notes:

1 – pce means pop can equivalent

2 – The tonnage of paper recycled is included with the cardboard for Syncrude.

Input By: PVDW
Checked By: AV

APPENDIX C

MASS BALANCE

Mass Balance for Waste Diversion Systems

	System 1	System 2		System 3		System 4		System 5	
	Status Quo	Leaf and Yard		CRD Recycling		Curbside Recycling		Composting	
		Diff.	Total	Diff.	Total	Diff.	Total	Diff.	Total
Residential Waste									
Municipal Waste Collection	23,133	-2323	20,810	0	20,810	-4227	16,583	-4283	12,300
Existing Depot Collection	500	50	550	0	550	100	650	50	700
Milk Jug Recycling	8	0	8	0	8	2	10	1	11
Beverage Container Diversion	1,784	80	1,864	0	1,864	100	1,964	50	2,014
Collection of Recyclables	0	0	0	0	0	3,900	3,900	700	4,600
Public Drop-off Yard Waste	400	0	400	0	400	0	400	0	400
Yard Waste Collection	0	2170	2,170	0	2,170	0	2,170	210	2,380
Organic Waste to Compost Plant	0	0	0	0	0	0	0	3,200	3,200
Reuse Centre	0	0	0	0	0	0	0	0	0
Landfill Recycling	750	0	750	0	750	100	850	50	900
Residential Waste Reduction	230	23	253	0	253	25	278	22	300
Total Residential Waste	26,805	0	26,805	0	26,805	0	26,805	0	26,805
IC&I Waste:									
IC&I Waste Delivered to Landfill	30,402	-380	30,022	0	30,022	-3993	26,029	-2897	23,132
IC&I Recyclables	0	0	0	0	0	3,745	3,745	500	4,245
Yard Waste Drop off	0	350	350	0	350	65	415	0	415
Organic Waste to Compost Plant	0	0	0	0	0	0	0	2,310	2,310
Landfill Recycling	750	0	750	0	750	150	900	50	950
Contaminated Soils	0	0	0	0	0	0	0	0	0
IC&I Waste Reduction	300	30	330	0	330	33	363	37	400
Total IC&I waste	31,452	0	31,452	0	31,452	0	31,452	0	31,452
CRD Wastes									
CRD Wastes to landfill	27,089	0	27,089	-19400	7,689	0	7,689	0	7,689
Rubble and Aggregate	0	0	0	4,600	4,600	0	4,600	0	4,600
Wood	0	0	0	7,600	7,600	0	7,600	0	7,600
Sorting Line	0	0	0	7,200	7,200	0	7,200	0	7,200
Total CRD Wastes	27,089	0	27,089	0	27089	0	27089	0	27089
Summary:									
Residential Waste Diverted	3,672		5,995		5,995		10,222		14,505
Total Residential Waste	26,805		26,805		26,805		26,805		26,805
Diversion Rate for Residential Waste Stream	**13.7%**		**22.4%**		**22.4%**		**38.1%**		**54.1%**
IC&I Waste Diverted	1,050		1,430		1,430		5,423		8,320
Total IC&I Waste	31,452		31,452		31,452		31,452		31,452
Diversion Rate for IC&I Waste Stream	**3.3%**		**4.5%**		**4.5%**		**17.2%**		**26.5%**
C&D Waste Diverted	0		0		19,400		19,400		19,400
Total C&D Wastes	27,089		27,089		27,089		27,089		27,089
Diversion Rate for CRD Waste Stream	**0.0%**		**0.0%**		**71.6%**		**71.6%**		**71.6%**
Total Waste Diverted	4,722		7,425		26,825		35,045		42,225
Total Waste	85,346		85,346		85,346		85,346		85,346
Diversion Rate for Total Waste Stream	**5.5%**		**8.7%**		**31.4%**		**41.1%**		**49.5%**

APPENDIX D

FINANCIAL ANALYSIS

Financial Analysis System1 - Status Quo and Enhanced Depot			
	Tonnages	$/tonne	Annual Cost
WASTE COLLECTION			
Curbside collection	23,133	$70.00	$1,619,310
Capital collection costs			$0
User fee revenue			$0
Subtotal waste collection	**23,133**		**$1,619,310**
DISPOSAL			
Municipal waste collection	23,133		
CRD Waste	27,089		
IC&I waste	30,402		
Incoming waste	80,624		
Landfill operating cost	80,624	$55.00	$4,434,320
Landfill tipping fee revenue	57,491	$0.00	$0
Subtotal disposal	**80,624**		**$4,434,320**
REDUCTION			
Communications and Education		$0.00	$0
Residential waste reduction	230	$0.00	$0
IC&I waste reduction	300	$0.00	$0
Subtotal reduction	**530**		**$0**
CRD DIVERSION			
Tonnes diverted	0	$0.00	$0
Annualized capital costs	0	$0.00	$0
Subtotal CRD			**$0**
RECYCLING			
Depot collection	500	$900.00	$450,000
IC&I recyclables	0	$0.00	$0
Recyclables processed	0	$0.00	$0
Landfill diversion (brush, tires, scrap metal)	1,500	$0.00	$0
Beverage Container Recycling	1,784	$0.00	$0
Milk jug recycling	8	$0.00	$0
Annualized capital costs	0	$0.00	$43,200
MRF tipping fee revenue	0	$0.00	$0
Sale of recyclables revenue	0	$0.00	$0
Subtotal recycling	**3,792**		**$493,200**
ORGANICS			
Yard waste collection	0	$0.00	$0
yard waste drop off	400	$0.00	$0
yard waste composting	400	$0.00	$0
Yard Waste Capital Costs	0	$0.00	$0
organics collection (residential)	0	$0.00	$0
IC&I organics dropped off	0	$0.00	$0
Organics composting	0	$0.00	$0
Annualized capital organics cost	0	$0.00	$0
Compost plant tipping revenue	0	$0.00	$0
Sale of compost revenue	0	$0.00	$0
Subtotal organics	**400**		**$0**
REDUCTION	530		
DIVERSION COSTS (including organics)	4,192	**$118**	$493,200
DISPOSAL & WASTE COLLECTION COSTS	80,624	**$75**	$6,053,630
TOTAL SYSTEM COSTS	85,346	**$77**	$6,546,830

Input By: MC
Checked By: AV

Financial Analysis System 2 - Leaf and Yard Waste Collection and Processing			
	Tonnages	$/tonne	Annual Cost
WASTE COLLECTION			
Curbside collection	20,810	$70.00	$1,456,700
Capital collection costs			$0
User fee revenue			$0
Subtotal waste collection	**20,810**		**$1,456,700**
DISPOSAL			
Municipal waste collection	20,810		
CRD Waste	27,089		
IC&I waste	30,022		
Incoming waste	77,921		
Landfill operating cost	77,921	$55.00	$4,285,655
Landfill tipping fee revenue	57,111	$0.00	$0
Subtotal disposal	**77,921**		**$4,285,655**
REDUCTION			
Communications and Education		$0.00	$0
Residential waste reduction	253	$0.00	$0
IC&I waste reduction	330	$0.00	$0
Subtotal reduction	**583**		**$0**
CRD DIVERSION			
Tonnes diverted	0	$0.00	$0
Annualized capital costs	0	$0.00	$0
Subtotal CRD			**$0**
RECYCLING			
Depot collection	550	$900.00	$495,000
IC&I recyclables	0	$0.00	$0
Recyclables processed	0	$0.00	$0
Landfill diversion (brush, tires, scrap metal)	1,500	$0.00	$0
Beverage Container Recycling	1,864	$0.00	$0
Milk jug recycling	8	$0.00	$0
Annualized capital costs	0	$0.00	$43,200
MRF tipping fee revenue	0	$0.00	$0
Sale of recyclables revenue	0	$0.00	$0
Subtotal recycling	**3,922**		**$538,200**
ORGANICS			
Yard waste collection	2,170	$70.00	$151,900
Yard waste drop off	750	$0.00	$0
Yard waste composting	2,920	$50.00	$146,000
Yard Waste Capital Costs	0	$0.00	$96,000
Organics collection (residential)	0	$0.00	$0
IC&I organics dropped off	0	$0.00	$0
Organics composting	0	$0.00	$0
Annualized capital cost	0	$0.00	$0
Compost plant tipping revenue	0	$0.00	$0
Sale of compost revenue	0	$0.00	$0
Subtotal organics	**2,920**		**$393,900**
REDUCTION	583		
DIVERSION COSTS (including organics)	6,842	**$136**	$932,100
DISPOSAL & WASTE COLLECTION COSTS	77,921	**$74**	$5,742,355
TOTAL SYSTEM COSTS	85,346	**$78**	$6,674,455

Financial Analysis SYSTEM 3 - Enhanced CRD Recycling			
	Tonnages	$/tonne	Annual Cost
WASTE COLLECTION			
Curbside collection	20,810	$70.00	$1,456,700
Capital collection costs			$0
User fee revenue			$0
Subtotal waste collection	**20,810**		**$1,456,700**
DISPOSAL			
Municipal waste collection	20,810		
CRD Waste	7,689		
IC&I waste	30,022		
Incoming waste	58,521		
Landfill operating cost	58,521	$55.00	$3,218,655
Landfill tipping fee revenue	37,711	$0.00	$0
Subtotal disposal	**58,521**		**$3,218,655**
REDUCTION			
Communications and Education		$0.00	$0
Residential waste reduction	253	$0.00	$0
IC&I waste reduction	330	$0.00	$0
Subtotal reduction	**583**		**$0**
CRD DIVERSION			
Tonnes diverted	19,400	$45.00	$873,000
Annualized capital costs	0	$0.00	$202,200
Subtotal CRD	**19,400**		**$1,075,200**
RECYCLING			
Depot collection	550	$900.00	$495,000
IC&I recyclables	0	$0.00	$0
Recyclables processed	0	$0.00	$0
Landfill diversion (brush, tires, scrap metal)	1,500	$0.00	$0
Beverage Container Recycling	1,864	$0.00	$0
Milk jug recycling	8	$0.00	$0
Annualized capital costs	0	$0.00	$43,200
MRF tipping fee revenue	0	$0.00	$0
Sale of recyclables revenue	0	$0.00	$0
Subtotal recycling	**3,922**		**$538,200**
ORGANICS			
Yard waste collection	2,170	$70.00	$151,900
Yard waste drop off	750	$0.00	$0
Yard waste composting	2,920	$50.00	$146,000
Yard Waste Capital Costs	0	$0.00	$96,000
Organics collection (residential)	0	$0.00	$0
IC&I organics dropped off	0	$0.00	$0
Organics composting	0	$0.00	$0
Annualized capital cost	0	$0.00	$0
Compost plant tipping revenue	0	$0.00	$0
Sale of compost revenue	0	$0.00	$0
Subtotal organics	**2,920**		**$393,900**
REDUCTION	583		
DIVERSION COSTS (including organics)	26,242	**$76**	$2,007,300
DISPOSAL & WASTE COLLECTION COSTS	58,521	**$80**	$4,675,355
TOTAL SYSTEM COSTS	85,346	**$78**	$6,682,655

Financial Analysis SYSTEM 4 - Residential Curbside Collection and Processing of Recyclables			
	Tonnages	$/tonne	Annual Cost
WASTE COLLECTION			
Curbside collection	16,583	$70.00	$1,160,810
Capital collection costs			$0
User fee revenue			$0
Subtotal waste collection	**16,583**		**$1,160,810**
DISPOSAL			
Municipal waste collection	16,583		
CRD Waste	7,689		
IC&I waste	26,029		
Incoming waste	50,301		
Landfill operating cost	50,301	$55.00	$2,766,555
Landfill tipping fee ($27.50/tonne) revenue	33,718	$0.00	$0
Subtotal disposal	**50,301**		**$2,766,555**
REDUCTION			
Communications and Education		$0.00	$100,000
Residential waste reduction	278	$0.00	$0
IC&I waste reduction	363	$0.00	$0
Subtotal reduction	**641**		**$100,000**
CRD DIVERSION			
Tonnes diverted	19,400	$45.00	$873,000
Annualized capital costs	0	$0.00	$202,200
Subtotal CRD	**19,400**		**$1,075,200**
RECYCLING			
Depot collection	650	$700.00	$455,000
IC&I recyclables	3,745	$0.00	$0
Residential Recylables	3,900	$110.00	$429,000
Recyclables processed	8,295	$110.00	$912,450
Landfill diversion (brush, tires, scrap metal)	1,750	$0.00	$0
Beverage Container Recycling	1,964	$0.00	$0
Milk jug recycling	10	$0.00	$0
Annualized capital costs	0	$0.00	$997,000
MRF tipping fee revenue	3,745	$50.00	-$187,250
Sale of recyclables revenue	8,945	$50.00	-$447,250
Subtotal recycling	**12,019**		**$2,158,950**
ORGANICS			
Yard waste collection	2,170	$70.00	$151,900
Yard waste drop off	815	$0.00	$0
Yard waste composting	2,985	$50.00	$149,250
Yard Waste Capital Costs	0	$0.00	$96,000
Organics collection (residential)	0	$0.00	$0
IC&I organics dropped off	0	$0.00	$0
Organics composting	0	$0.00	$0
Annualized capital cost	0	$0.00	$0
Compost plant tipping revenue	0	$0.00	$0
Sale of compost revenue	0	$0.00	$0
Subtotal organics	**2,985**		**$397,150**
REDUCTION	641		
DIVERSION COSTS (including organics)	34,404	**$108**	$3,731,300
DISPOSAL & WASTE COLLECTION COSTS	50,301	**$78**	$3,927,365
TOTAL SYSTEM COSTS	85,346	**$90**	$7,658,665

Financial Analysis SYSTEM 5 - Residential Curbside Collection and Processing of Organics			
	Tonnages	$/tonne	Annual Cost
WASTE COLLECTION			
Curbside collection	12,300	$70.00	$861,000
Capital collection costs			$0
User fee revenue			$0
Subtotal waste collection	**12,300**		**$861,000**
DISPOSAL			
Municipal waste collection	12,300		
CRD Waste	7,689		
IC&I waste	23,132		
Incoming waste	43,121		
Landfill operating cost	43,121	$55.00	$2,371,655
Landfill tipping fee ($27.50/tonne) revenue	30,821	$0.00	$0
Subtotal disposal	**43,121**		**$2,371,655**
REDUCTION			
Communication and Education			$100,000
Residential waste reduction	300	$0.00	$0
IC&I waste reduction	400	$0.00	$0
Subtotal reduction	**700**		**$100,000**
CRD DIVERSION			
Tonnes diverted	19,400	$45.00	$873,000
Annaulized capital costs	0	$0.00	$202,200
Subtotal CRD	**19,400**		**$1,075,200**
RECYCLING			
Depot collection	700	$700.00	$490,000
IC&I recyclables	4,245	$0.00	$0
Residential Recylables	4,600	$110.00	$506,000
Recyclables processed	9,545	$110.00	$1,049,950
Landfill diversion (brush, tires, scrap metal)	1,850	$0.00	$0
Beverage Container Recycling	2,014	$0.00	$0
Milk jug recycling	11	$0.00	$0
Annualized capital costs	0	$0.00	$997,000
MRF tipping fee revenue	4,245	$50.00	-$212,250
Sale of recyclables revenue	10,245	$50.00	-$512,250
Subtotal recycling	**13,420**		**$2,318,450**
ORGANICS			
Yard waste collection	2,380	$70.00	$166,600
Yard waste drop off	815	$0.00	$0
Yard waste composting	3,195	$50.00	$159,750
Yard Waste Capital Costs	0	$0.00	$96,000
Organics collection (residential)	3,200	$110.00	$352,000
IC&I organics dropped off	2,310	$160.00	$369,600
Organics composting	3,200	$160.00	$512,000
Annualized capital cost	0	$0.00	$653,000
Compost plant tipping revenue	2,310	$160.00	-$369,600
Sale of compost revenue	5,510	$25.00	-$137,750
Subtotal organics	**8,705**		**$1,801,600**
REDUCTION	700		
DIVERSION COSTS (including organics)	41,525	**$128**	$5,295,250
DISPOSAL & WASTE COLLECTION COSTS	43,121	**$75**	$3,232,655
TOTAL SYSTEM COSTS	85,346	**$100**	$8,527,905

APPENDIX E

JURISDICTIONAL REVIEW

Assessment of Waste Diversion Initiatives/Programs in Other Jurisdictions

It is useful to understand the types of waste diversion programs that are used in other jurisdictions. The information was used to assist with developing the waste reduction strategy for the RMWB.

The project team undertook recycling systems research by reviewing the recycling and composting programs (collection, processing, transportation and marketing) of the following communities:

- City of Flin Flon Manitoba
- City of Grande Prairie
- City of Leduc
- City of Lethbridge
- City of Medicine Hat
- City of Red Deer
- City of Spruce Grove
- Town of Banff
- Town of Canmore
- Town of Jasper
- Town of Inuvik
- Town of Squamish/Town of Whistler

These municipalities were selected because they had a similar population and/or were in a similar geographic area.

Information from the above municipalities was obtained by conducting surveys via telephone and email. The data is summarized in Table E.1.

An overview waste diversion initiatives in these municipalities is presented in Table E.2.

Almost all of the municipalities surveyed have recycling depots and this appears to be the typical manner in which these recyclables are captured in this area. Very few of the municipalities surveyed had curbside collection programs for recyclables. This is more common in central and eastern Canada, even in municipalities of the RMWB's size. Some communities offered limited cardboard collection and in some cases targeted the IC&I sector's (i.e. businesses) cardboard. Most municipalities surveyed had some type of yard waste program. Typically this involves delivery of this waste to a drop-off depot by a resident. Very few municipalities have a garbage bag limit.

Those municipalities surveyed that had a bag limit and/or curbside collection of food wastes tended to report highest waste diversion rates. The percentages of municipalities with various green initiatives is noted below:

- Recycling depots 92%
- Cardboard collection 33%
- Food waste composting 25%
- Leaf and yard waste composting 58%
- Bag limit 16%
- Other programs (e.g. e-waste)

Assessment of Waste Diverison Initiatives/Programs in Other Jurisdictions

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
City of Flin Flon (Manitoba) **Population** 6,267 (2001) **Total Waste (2005)** NA **Contact Information** Doreen Murray, District Environment Council 204-687-6169 ffdec@mts.net	• **Curbside Recycling Collection** • **Recycling depot (one)** • **Commercial OCC Collection.** **Comments** Information provided to residents on composting however no municipal composting program. There are no bottle depots. Promotional initiatives include: advertise in local media, presentations to schools, offer tours (write ups for paper). There is a holding area at the local landfill where there is decommissioning of old refrigerators (i.e. removal of Freon).	**Curbside Recycling Collection** OCC, ONP, #1 and #2 plastics, all tin, aluminum, phone books, flyers, catalogues, fiber egg cartons **Recycling Depot** OCC, ONP, #1 and #2 plastics, all tin, aluminum, phone books, flyers, fiber egg cartons Used oil can be taken by residents to eco-centre at the landfill. **Commercial OCC Collection** OCC **Diversion** Recyclables collected in 2005 were 455 Tonnes. This included the amounts collected via curbside collection, depots, collections from businesses and amounts salvaged from the landfill. Roughly estimated that 20% of residential MSW is recycled.	**Curbside Recyclable collection** Collected by Municipality. The City has a Dodge pick up truck retrofitted to collect recyclables **Recycling depot** Residents deliver to recycling depot. Municipality empties depot. **Commercial OCC Collection** Collected by Municipality.	**Curbside Recyclable Collection** Residents separate paper from tins and plastics. There is further sorting at a staging area (by the Municipality). The Municipality bales the recyclables.	Truck collects recyclables (and takes them to market) on a weekly basis. Collect 4,000 – 8,000 kg (estimated) of recyclables per week at a cost of roughly $600 per week.	Recyclables go to Metro Materials Recovery in Winnipeg.	**Capital Cost (Estimated)** **Curbside Recycling and Commercial OCC Collection** $150,000 (cost for new building – staging area). $15,000 (cost for pickup truck) $2,500 (cost to retrofit pick up truck) **Recycling depot** $3,000 (cost for depot – i.e. the collection bins) **Operating Cost** $250,000 (2005) operating budget. This pays for building costs, operating vehicles registration fuel, labor, for 11 people, expense to transport to market (freight, etc.). The human resources are 11 plus 4 to 6 volunteers and one manager. Employees sort, pick up recyclables, bale, prepare recyclables for market. Total human resources are 16-18. **Revenues** $179,000 revenues from recyclables (2005) Refunds for recyclables vary. For instance refund for cardboard varied from 0-

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
							$65/Tonne.
City of Grande Prairie **Population** 44,631 (2005) **Total Waste (2005)** Residential Waste: 9,600 Tonnes ICI Waste 57,800 Tonnes C&D 2,100 Tonnes. Tonnages above do not include materials removed for recycling at the landfill. **Contact Information** Uli Wolf, Solid Waste Services Supervisor, Aquatera, 780-538-0360, 780-532-3996 (main) uwolf@aquatera.ca,	• **Seasonal Leaf and Yard Waste Collection.** • **Recycling Depots (9)** • **Cardboard Diversion Program - encourage the recycling of cardboard for businesses.** • **Recycle Centre for Building Materials.** • **Bag Limit** **Comments** Cardboard Diversion Program - businesses with a non-residential water meter are affected. There is a $7.50 cardboard recycling fee on their monthly utility bill.This covers the cost of over 55 community cardboard recycling bins that have been placed in key commercial areas. Recycle Centre for Building Materials - allows businesses and residents to dispose of their re-useable building materials or purchase good quality, inexpensive recycled building supplies. Other Implemented 3 bag limit. Residents may dispose more for additional cost. Christmas trees are	**Seasonal Leaf and Yard Waste Collection** Leaf and yard waste **Recycling Depots** Eight of the depots accept mixed paper, cardboard/boxboard, glass, tin and plastic (# 1, 2, 4 & 5). The main depot (the Eco Centre) also accepts: e-waste, fluorescent light tubes, used oil filters and containers, HHW (year round and free of charge) including paint, vehicle batteries, rechargeable batteries, cell phones, beverage containers with a deposit, printer cartridges, shredded paper, packing paper, yard waste and branches. **Diversion** **Total tonnages (2005)** Residential recycling program 1,700 tonnes e-waste 200 tonnes HHW 110 tonnes. Used Oil, Filtres and Container 22 tonnes. Total yard waste 1,100	Depots are operated by private contractor Yard waste is collected curb side through a private contractor. Aquatera collects the yard waste and branches that are disposed of at the Eco Centre with a roll off truck.	There is pre sorting via separate bins for mixed paper, cardboard, plastic and glass at our unmanned depots. At the Eco Centre there are separate bins for shredded paper, packing paper. Utilize roll off bins for yard waste and branches. Municipality handles the electronic waste and fluorescent light tubes by palletizing and getting it ready for shipment to processor.	Handled by contractor	Handled by contractor. E-waste is shipped to a qualified processor under ARMA.	**Capital Cost** NA **Operating Cost** **Recycling depots** Contract out the collection and processing for residential depots. There is a manned depot at the Eco Centre. There are 2 permanent staff that work full time (80 hours per 2 week pay period) during the summer hours of operation. During the winter period there are 2 permanent part time staff (60 hours per 2 week pay period). There is one additional casual employee (hours vary).

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
	collected and mulched and recycled each year for free	tonnes.					
City of Leduc **Population** 15,630 (2003) **Total Waste (2005)** Residential Waste: 5,700 Tonnes Commercial: 7,500 Tonnes Building and Construction: 2,200 Tonnes Concrete: 500 Tonnes Daily Cover: 44,000 Tonnes **Contact Information** Mr. Stavros Salmas Municipal Engineer 980-7177 ssalmas@leduc.ca	• **Recycling depot** • **Leaf and yard waste collection (curbside collection and residents drop off).** • **Annual Christmas Tree Pickup** • **Garbage Limit 4 bags** **Comments** There is also a large item pick up once per year in the spring. Items such as carpets, appliances, furniture. There is a toxic round up where residential HHW is collected.	**Recycling Depot** ONP, tin cans, glass, corrugated cardboard, glossy (magazines, catalogues, glossy flyers), milk cartons, mixed paper, and plastic (white, coloured and frosted #2 plastics). **Curbside leaf and Yard waste collection** Leaf and yard waste **Diversion** 1,700 Tonnes annual (approx.) (leaf and Yard) Composting facility operated by the Leduc & District Regional Waste Management Authority 800 Tonnes (2005) collected at the depot and diverted from the Leduc District Regional Landfil.	Residents drop off recyclables (at depot) and leaf and yard waste (at transfer station). There is seasonal curbside collection of leaf and yard waste.	Cardboard is compacted (compactor at the recycling depot)	Contractor empties bins and transports recyclables to markets. Leaf and yard waste is transported from the transfer station to the Leduc & District Regional Waste Management Authority composting facility.	Allied Paper Savers is the contractor which takes most of the recyclables. They collect: OCC, Old Newspaper, sorted office waste (office paper), #2 H.P.D.E plastic, old magazines, and tin. Reportedly, all materials collected by Allied are recycled. Tin is taken to a scrap dealer and is re-melted into a recycled product, plastics are sold to a plastics dealer, paper is recycled, 10-20% of OCC and newspaper are utilized by Allied to make weather shield insulation.	**Operating Cost** The contracted Services Budget for operating expenditures for recycling and Composting was $73,000 for 2005. **Refunds** Varies **Promotional Budget** $1,200.

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
City of Lethbridge **Population** 78,713 **Total Waste (2005)** Residential: 19,400 Tonnes Commercial: 6,900 Tonnes Sludge: 600 Tonnes Parks: 400 Tonnes Com (Dept.): 4,800 Tonnes Street/Roads: 0 Tonnes Street Roads-Asphalt: 0 Tonnes Water Works: 0 Tonnes Water Works Asphalt: 3,200 Tonnes Free Disposal: 2,800 Tonnes Spring Clean up: 1,800 Tonnes 28 Street Clean up: 12 Tonnes TOTAL = 39,848 Tonnes **Contact Information** Mr. Steve Rozee srozee@lethbridge.ca 403-320-3114	• **Recycling depots (7)** • **Grasscycling promotion in the community.** • **Collection of grass clippings and yard waste at some depots** • **Chipping of residential trees and branches** • **Collection HHW and E-waste** **Comments** In the spring of each year the City hires a contractor to chip trees and branches placed in the lane by residents. The chips are reused in City parks and some are made available for residents to use. There are six drop-off events a year for the collection of hazardous waste and Ewaste that is recycled through the Alberta Environment program. There is a permanent Ewaste drop off site at the landfill.	**Recycling depot** Cardboard including: OCC, OBB i.e. cereal boxes , Clear Glass including: Clear glass bottles and jars, Metal Cans including: Tin and aluminum food or beverage cans i.e. soup cans, pop cans, Mixed Paper including: ONP, magazines, junk mail, envelopes, office paper, shredded paper (in bags), all household paper, All Numbered Plastic & Plastic Bags including: All numbered plastics, any plastic with a number from 1-7 on the bottom of the container and clean plastic bags i.e. grocery bags **Diversion** **Recycling Depots** 2005 - 2,700 Tonnes **Grasscycling** - Not tracked **Yard Waste Drop-offs 2006 estimate** – 108 to 147 Tonnes **Chipping Program** 2005 – 200 Tonnes **Christmas Tree Chipping 2005** – 49 Tonnes **HHW Round-up 2005** – 200 Tonnes **E-Waste**	Collection and marketing is the responsibility of the contractor. Some material is handled at a local facility and some is taken to Calgary depending on markets.	The materials are collected separately in individual containers.	Newspaper is shipped in compaction roll-off containers. Cardboard is shipped loose to a local contractor for preparation and shipping. Plastics are baled and shipped to Calgary where milk jugs are sorted out and the material is chipped.	Glass – Lethbridge Plastic – Vancouver VIA Calgary Metal – Lethbridge Cardboard – Lethbridge or Calgary Paper – Calgary	**Capital Cost** **Recycling depots** $75,000 to $85,000 per depot site (estimated). **Leaf and Yard Waste Collection** $4,000 (estimated) **Operating Cost** **Recycling depots** Recycling Depots 2005 operating budget $455, 000 without promotion and administration costs. **Grass cycling** $3,000 (2005) **Leaf and Yard Waste Collection** Unknown **Chipping** $47,000 **Christmas Tree Chipping** Unknown **Household Hazardous Round-up** $50,000 (2005) Ewaste Round-up/Drop-off 2005 operating funded with HHR City of Lethbridge has a contractor which finds the markets and the contractor obtains a portion of the refunds.

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
		Round up and Drop off – 200-300 Tonnes 7					
City of Medicine Hat **Population** 56,000 **Total Waste (2005)** 137,000 Tonne **Contact Information** Russel Smith (403) 529-8188 Russmi@medicinehat.ca	• **Recycling depots (4)** • **Yard waste curbside collection (seasonal)** • **Information on recycling provided on City of Medicine Hat website.** • **Drop off site for used oil, tires, HHW, Scrap metal, wood waste and yard waste.** • **Biosolids composting.** • **Two refundable bottle depots.** There is curbside collection of recyclables that is a private service and not offered by the City.	**Recycling depots** Paper: OCC, OBB, office paper, envelopes, junk mail, magazines, wrapping paper, newsprint, clean clear bottles and jars, aluminum and tin/steel food containers as well as lids, all types of clean plastic including plastic milk jugs, gable top (cardboard) milk cartons, used oil (at one depot location), residential household hazardous waste (at landfill, for drop off year round, free of charge) **Curbside Yard Waste Collection** Grass clippings, leaves, plant tree trimmings, weeds, bundles of branches 4 ft or less. **Diversion** 3,300 Tonnes (2005) yard waste. 4900 Tonnes (2005) recyclables, however this includes commercial recycled	A private non-profit organization (REDI Enterprises) operates the Material Recovery Facility under contract with the City of Medicine Hat. They are responsible for the collection from the public drop-off depots and processing of the recyclable material.	Residents deposit recyclable material into specified bins. Material further separated (collected from depots) at the MRF. Pre sorting and baling at MRF.	Various private trucking companies transport recyclables to market. The cost to transport each stream is approximately $13/tonne and is transported by private transport companies.	No information available.	**Capital Cost** Depots Compost Site, MRF $1.2m **Recycling depots** $200k **MRF** $1.2m **Compost Site** $400k **Operating Cost** The cost to process each waste stream is roughly $100/tonne. **Promotional Budget** The budget for recycling promotion is approximately $30k. **Comments** The refunds received from the recycling do not cover the costs of the recycling program. A $2.85 waste diversion fee is currently charged to all accounts to help offset the costs of the waste diversion programs The monthly fee of $2.85 charged to residents covers the cost of maintaining depots, yard waste collection,

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
		tonnages not handled by the Municipality. The depots account for roughly 80% of this tonnage (4000 Tonnes).					handling recyclables.
City of Red Deer **Total Waste (2005)** 110 000 Tonnes (landfilled) **Population** 79,082 **Contact** Pam Vust 403-342-8751 Janet Whitesell 403-309-8553 Jeff Miller jeff.miller@reddeer.ca Terry Rawley Terry.rawley@reddeer.ca (403) 342-8111 (main number)	• **Curbside collection of leaf and yard waste (seasonal)** • **Composting facility** • **Blue box program.** • **Recycling depots** • **Recycle tire, Ewaste, propane tanks, scrap metal (all dropped off at the landfill)** • **Take it or leave it centre for furniture (at the landfill).** • **HHW drop off (at landfill, year long).** • **Toxic roundup (annual)**	**Curbside leaf and Yard waste collection** Leaf and yard Waste **Blue Box** Glass, metal, newspaper, magazines, mixed paper, OCC, milk cartons, #2 plastics **Recycling depots** Paper recycling depot for individuals and small businesses. **Diversion** 2004- 3500 Tonnes through blue box, 7700Tonnes (recyclables at landfill, include yard waste). Waste management facility services Part of Red Deer County, Innisfail, Silvan Lake, Penhold, Delburn, Elnora, and Bowden. People from all of these municipalities bring waste and recyclables to the landfill. The recycled	No information available.	**Tire, Ewaste, scrap metal drop off** Divide material in categories (i.e. scrap metal is not mixed in with tire etc.) Freon removed etc. No other processing.	No information available.	No information available.	**Operating Cost (Red Deer Waste Management Facility)** Budget for 2005 was $1.2 million for operational (includes the operation of the landfill, compost facility, anything on the site at the Red Deer Waste Management facility. **Other Operating Costs (approx.)** **Curbside collection (garbage and yardwaste pickup) (2006)** $1.6 million annually to pay contractor. **Operation of Compost facility** $93,000 **Blue Box pickup** $850,000 **Household Hazardous Waste Drop Off** $23,000 **Promotional budget**

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
		Tonnes is reflective of everyone's diversion.					To promote collection $18,000 To promote recycling $20,000 To promote the landfill $14,000
City of Spruce Grove **Population** 18,405 **Total Waste (2005)** 5,200 tonnes of residential waste, 2400 tonnes of organic waste and recyclables **Contact** Jayne Holmes Sustainable Development Coordinator (780) 962-7634 Ext 164, jholmes@sprucegrove.org	• **Seasonal Curbside Organics program,** • **Recycling depot** • **Weekly newspaper pickup** • **Information on Edmonton Freecycle Network website.** • **Toxic round up once per year at the recycling depot.** • **Spruce Grove Bottle Depot location provided on website** • **Information on disposal of used oil is provided on Spruce Grove website.**	**Seasonal Curbside Organics Collection** Leaf and yard waste, residential organics (food). **Recycling Depot** Newsprint, flyers, clean waste paper, magazines and mixed paper, Corrugated cardboard, Metal cans, Milk cartons, Plastic milk jugs and Clear #2 Plastic, Glass jars, E-waste (Electronic & Computer Waste), Car Batteries & Rechargeable batteries/cell phones, Tires **Diversion** 32% (2005) Total organics collected 1,800 tonnes (2005)	Recycling depot is part of waste collection contract.	Residents must pre-sort their recyclables.	Information not available.	Information not available.	**Operating Cost** **Seasonal Organics Curbside Collection** $19.21/Tonne to process the organics.

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
Town of Banff **Population** 7,800	• **Recycling depots** • **Recycling Trailer** • **OCC Collection** • **Scrap metal bin at Operations Yard** • **Tires (residential) accepted at Francis Cook Class III Landfill** • **Bottle Depot** • **Yard Waste (bagged lawn clippings dropped off at operations yard).** • **Biosolids Composting** • **Paint exchange and household hazardous roundup.** • **Plastic grocery bags: Accepted at Banff grocery stores.** • **Spring and Fall Large Item Clean up (oversized residential waste such as furniture) collected.**	**Recycling depot and Recycling Trailer** OCC, office paper, ONP, cans, glass jars, and magazines: Clean, sorted cardboard, office paper and newsprint, regular and aerosol cans, glass containers and magazines **Bottle Depot** Refundable Beverage Containers: With the exception of milk containers and concentrate bottles, all ready-to-serve beverage containers purchased in Alberta can be returned for cash at bottle depot or may be disposed at collection bins found throughout the Town.	Some recyclables taken to baling building, others to operations yard for pickup by recycling operators. Collected by Town, or delivered by Public Town Collects recyclables using cardboard truck, recycling trailer, residential truck, flat deck truck, or delivered by residents and commercial operators to depots.	Pre-sorting and baling	Shipped using private haulers.	Information not available.	Information not available.

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
Town of Canmore **Population** 11,458 **Contact** Andreas Comeau 403-678-1500, Andreas Comeau, acomeau@canmore.ca	• **OCC Collection** • **Recyclables Depots** • **Bottle Depots** • **Yard waste drop off** • **Large item pick up (twice per year)** • **Toxic roundup (twice per year)**	**Recyclables Depot** Car batteries, Cardboard, Computers and accessories, Fluorescent lamps Glass, Glycol, Magazines, Metal Mixed paper, Milk jugs, ONP, Plastics 1 through 7 (except plastics bags (4) and Polystyrene (6)), Textiles and toys Used oil, Used oil filters, Used plastic oil containers **Diversion** MSW (commercial, development and residential). Currently there has been an increase in waste to landfill (class II and III). Per capita diversion is 0.99 Tonnes and 0.97 landfilled.	Delivered by residents and commercial operators to depots.	Canmore has a staging and transfer area for recyclable wastes Pre-sorting and baling.	Roll off, tractor-trailer or cube van. Shipped using private hauler.	Fibre – Variety of markets (Calgary, Edmonton, Vancouver, Washington state) Glass – Exshaw Metal – Calgary Plastic – Calgary	**Capital Cost** **OCC Collection** containers = $6,000/each x 4 plus truck/baler) **Recycling depots** Recyclables Depots ($60,000 /site and $40,000 for mobile trailer) **Operating Cost** To service recycling depots $70,000. **Yard Waste** $20,000 (per year) **Promotional Budget** $6,400

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
Town of Jasper **Population** 4,643 (2006) **Total Wastes (2005)** 3,300 Tonnes (approx.) **Contact** Nicole Ward, 780-852-1563,nward@town.jasper.ab.ca	• **OCC Collection (Central Business District)- commercial only** • **Compost (kitchen organics) drop-off bins (4)** • **Yard waste bins (seasonal)** • **Yard waste collection (spring 2 days and fall 2 days)** • **Recycling Depots (2)** • **HHW and E-waste Round Up Annually (June)** • **Recycling collection (The Jasper Recycling Society)**	**Recycling Depot** Batteries , OCC Clean/painted wood Glass, Milk Cartons Milk Jugs , Mixed paper Newspaper, Food waste, Scrap metal Tin cans , Tires White goods **Diversion** (assume residential) 20%, this included recycling from depots, compost, white goods, tires, e-waste etc.)	Delivered by residents and commercial operators to depots and some recyclables to transfer station. Town collects cardboard from commercial operators. Glass, tin cans and food are collected from wildlife proof bins. Glass and tin cans are collected by the municipality and transported to the transfer station.	Pre-sorting cans and baling. Glass and tin cans are shipped in bulk (loose).	Cardboard, newspaper and mixed paper transported using private hauler.	All paper fiber is backhauled to Vancouver (Metro Waste), Plastic goes to Awax.	**Capital Cost** Recycling (this includes collection of OCC from central business district) Capital Cost was approximately $300,000 to start, excluding already existing infrastructure. **Operating Cost** Operational Cost is approximately $103,000 per year, operating at a deficit of ~ $60,000 Organics Collection is included into the solid waste budget
Town of Inuvik **Population** 3,451 (2000) **Total Wastes (2005)** 7,000 Tonnes (Total waste to landfill) **Contact** Rick Campbell, 867-777-8600 867-777-1311 rcampbell@town.inuvik.nt.ca	• **The government of the NWT set up a deposit for all drink**	**Diversion** 10 % (overall)	Information not obtained.	No processing	Recyclables transported to Edmonton	Recyclables transported to Edmonton	Information not available.

Municipality	Waste Diversion Initiatives Programs What programs do they have?	Wastes Diverted Measured Diversion?	Collection	Processing	Transportation	Marketing	Costs (Capital, Operating, Revenues)
Towns of Squamish/Whistler **Population** 14,000 (Squamish), 10,000 (Whistler) **Total Wastes (2005)** 26,000 Tonnes (Squamish and Whistler) **Contact** Jesse Lee, (604) 894-6371, jlee@slrd.bc.ca	• **Recyclables Depots** • **Re-use it store in Whistler** • **Industrial Compost Facility (Squamish). The operation is currently shut as of September 1, 2006.** • **Yard waste composting**	**Recycling depots** Car batteries, Cardboard, Clean wood Dry wall, Glass Household batteries, Mixed paper , Non-refundable plastics Non- refundable , metals **Diversion** Industrial Compost Facility in 2005 diverted approximately 8,000 Tonnes in 2005 from the Squamish, Lillooet Regional District and an additional 6,000 Tonnes from the GVRD. No information on recycling programs.	Delivered by residents to depots or private contractor collects from commercial operators. In Whistler, commercial operators take their recyclables to MRF in Whistler	Pre-sorting, baling and chipping. MRF in Whistler, processing facility in Squamish.	Shipped using private hauler. Average cost is about $5/tonne to haul from Squamish to Vancouver.	(information from 2004) Refunds vary. • Car batteries no cost no refund • Household batteries $1000/tonne (cost) • Mixed paper $10/tonne (refund) • Non refundable glass $5/tonne (cost includes labour, transportation, and overhead • OCC $25/tonne (refund) • Plastics net cost $20-$30/tonne (cost includes labour transportation and overhead) • Tin cans and aluminum - no refund .	Costs not available

Notes: a) Tonnages are rounded to nearest hundredth
b) NA – Not available
OCC- Old Corrugated Cardboard
OBB – Old Boxboard
ONP- Old Newspaper
HHW- Household Hazardous Waste

Input By: PVDW
Checked By: AV

Table E2 Green Initiatives Overview

Municipality	Curbside Recycling	Depot Recycling	OCC Collection Commercial	Food Waste Composting	Leaf and Yard Waste Composting	Bag Limit	Other
City of Flin Flon	Y	Y	Y				
City of Grande Prairie		Y	Y		Y	Y	Y
City of Leduc		Y		Y	Y	Y	Y
City of Lethbridge		Y			Y		Y
City of Medicine Hat		Y			Y		Y
City of Red Deer	Y	Y			Y		Y
City of Spruce Grove		Y		Y	Y		Y
Town of Banff		Y	Y		Y		Y
Town of Canmore		Y			Y		Y
Town of Jasper		Y	Y	Y	Y		Y
Town of Inuvik							Y
Towns of Whistler/Squamish		Y			Y		Y

Table E2.3 depicts waste diversion rates across these various municipalities as reported.

Table E2.3 Overview of Waste Diversion in Various Municipalities

Municipality	Residential Waste	Total Waste (excluding diverted wastes)	Diversion Programs	Total Waste (including diverted wastes)	Residential Diversion Rate	Overall Diversion Rate	Comment
	Tonnes/yr				%	%	
Flin Flon, MB	na	na	455	na	20	na	
Grande Prairie, AB	9,600	69,500	3,000	72,500	24	4	
Leduc, AB	5,700	15,900	2,500	18,400	30	14	
Lethbridge, AB	19,400	40,000	3,300	43,300	15	8	
Medicine Hat, AB	na	137,000	7,300	144,300		5	
Red Deer, AB	na	110,000	11,200	121,200	na	9	
Spruce Grove, AB	5,200	na	2,400	na	32	na	
Banff, AB	na	na	na	na	na	na	
Canmore, AB	na	na	na	na	na	na	
Jasper, AB	na	3300	na	na	20	na	
Inuvik, NUN	na	7,000	777	na	na	10	
Squamish/Whistler, BC	na	26,000	8,000	34,000	na	24	Compost facility presently closed

Of the municipalities surveyed the highest residential waste diversion rate was 32% and was considerably lower in most communities. Overall waste diversion numbers, when reported, were even more modest.

What is clear from this survey is that although many communities have waste diversion programs in place few have high waste diversion rates. This is largely due to the passive nature of most of these recycling programs. Typically residents must take recyclables and in some cases yard waste

to a depot. This extra effort, relative to curbside collection, impedes the extent of waste diversion. Waste diversion in communities like Leduc, Spruce Grove and Grande Prairie that have at least limited collection, of recyclables or leaf and yard waste tends to be higher. From a residential perspective and to a lesser extent from an IC&I perspective some level of curbside collection will be critical to maximize waste diversion. Waste diversion from the IC&I and CRD sectors can be stimulated through the banning of certain items at the landfill or through economic disincentives.

REGIONAL MUNICIPALITY OF WOOD BUFFALO
COUNCIL REPORT

To:	Mayor and Council
From:	Engineering
Date:	April 8, 2008
Subject:	Snye Channel Rehabilitation Project

ISSUE:

A solution is required to mitigate the sediment buildup and weed growth in the Snye Channel, resulting from the construction of an earth dyke.

REFERENCES:

- Hydrological Evaluation of Snye by UMA Engineering 1991
- Snye Sedimentation Analysis and Model Study prepared by UMA Engineering Ltd. 1992
- Snye Sustainability Report, Golder Associates, October 2005
- Snye Channel Rehabilitation Project, Preliminary Design Report, Klohn Crippen Berger Ltd, June 2007

HISTORY:

The Snye Channel has been used by the local aviation industry as a floatplane base for many years, and is also used for recreational boating. In 1966, an earth dyke (the Snye dyke) was constructed across the west end of the Snye Channel, at the Athabasca River, to reduce the flood risk in the lower town site that generally resulted from ice jams in the Athabasca River. The dyke has blocked the regular flushing flow that previously maintained the Snye Channel, and annual dredging has been required to remove sediment and maintain navigability for floatplanes and boats, especially at the east (Clearwater River) entrance.

In 2005, Golder provided a report to Council on the feasibility of an inlet structure through the dyke, and an armored channel section at the east entrance, which would provide sufficient flow and velocity to remove sediment from the east entrance once a year instead of dredging. The construction cost estimate provided by Golder at that time was $6.5 Million, including engineering and contingency. Klohn Crippen Berger Ltd. (KCBL) has confirmed the technical findings of Golder, but reports that the real cost of the structures recommended by Golder in 2005 would be in the order of $25 Million in 2007. A smaller inlet structure and a more efficient operating scheme would still cost approximately $11 Million to construct.

The approved capital budget is $750,000.00. To date, $161,609.05 has been spent, leaving a balance of $588,390.95.

Department of Fisheries and Oceans Canada (DFO) and Alberta Sustainable Resources Development have indicated that they would prefer continuation of the dredging program, rather than the habitat disruption resulting from the construction of the structures and from the high water velocities generated by the operation of the inlet structure.

Following a Council Workshop at which preliminary design report findings and recommendations were presented, Administration met with the Snye Committee to get their agreement on the report recommendations. A meeting was held with the members of the project team (Robin FitzGerald – KCBL and Salem Abushawashi - RMWB) and various stakeholders of the Snye (Jane Hetfleis – Rowing Club, Ray Ruelling – Float Plane Operator, John Semple – Points North Adventures Ltd. and Tom Weber – Community Member).

The stakeholders are in general agreement with the report recommendations and have suggested the following issues be addressed in future studies/programs:

- Diversion of storm water away from the Snye
- Discuss with Department of Fisheries and Oceans the possibility and feasibility of reopening the existing culvert
- Full sonar survey of the Snye to be conducted

ALTERNATIVES:

1. Continue with the design and construction of the Snye channel structures.
2. Terminate design development of the structures and re-direct the engineering effort to develop and improve the dredging program.

ANALYSIS:

Construction of the structures (est. $11,000,000) will eliminate the need to dredge the east entrance of the Snye annually; however, it will not eliminate the need to perform maintenance dredging of the overall Snye channel approximately every 10 years (est. $500,000). Operation and maintenance of the structures will also cost an estimated $20,000 annually. The 50 year net present value of proceeding with Alternative 1 is in the order of $14.8 Million.

Annual dredging of the east end of the Snye currently costs from $50,000 to $100,000 per year approximately. Even if this is increased to $200,000 to improve the effectiveness of the annual dredging, and combined with the 10-year dredging of the overall Snye channel (est. $500,000), the 50 year net present value of proceeding with Alternative 2 is in the order of $7.6 Million, or 51% of Alternative 1. In order to prepare for the annual dredging, a Bathymetric Survey (a boat mounted sonar/GPS system that will determine the channel floor elevations) is needed to determine the amount of dredging that will be required and the estimated associated costs of the work involved.

ATTACHMENTS:

1. Executive Summary – Snye Channel Rehabilitation Project, Preliminary Design Report.
2. Drawing D-001, Location Plan (of Snye channel) from Preliminary Design Report.

3. Capital Budget Amendment.

ADMINISTRATIVE RECOMMENDATION:

1. THAT the Snye Channel Rehabilitation Project Preliminary Design (2007) report be received as information.

2. THAT the 2008 Capital Budget be amended as identified in Attachment 3 – Capital Budget Amendment Request – Snye Channel Rehabilitation Project, dated March 25, 2008.

3. THAT $50,000 from the current remaining capital budget be utilized for the bathymetric survey, analysis of the results, and establishing costs estimates to budget for the dredging program.

Regional Municipality of Wood Buffalo

Snye Channel Rehabilitation
Preliminary Design Report

A03128A01

June 2007

Klohn Crippen Berger

EXECUTIVE SUMMARY

The Snye channel is a natural channel that originally connected the Clearwater and Athabasca Rivers near the confluence of the two rivers in Fort McMurray. The Snye Channel has been used by the local aviation industry as a floatplane base for many years, and is also used for recreational boating. In 1966, an earth dyke (the Snye dyke) was constructed across the west end of the Snye Channel, at the Athabasca River, to reduce the flood risk in the lower town site that generally resulted from ice jams in the Athabasca River.

Prior to the construction of the Snye Dyke, flow in the Snye was generally from west to east conveying Athabasca water into the Clearwater River. Occasionally water would flow from east to west during periods of high water and high sediment loads in the Clearwater River. This resulted in considerable accumulation of sediment in the Snye. It has been observed that, before the dyke construction in 1966, the Snye Channel was kept open by the high velocities and flushing action of flood flows created by ice jams on the Athabasca River.

Golder Associates Ltd. carried out a study on the Snye Channel that is summarized in the report entitled "Snye Sustainability Study, October 2005". The four project objectives presented in Golder 2005 are as follows:

- Maintain a navigable water body between the Snye Channel and the Clearwater River.
- Maintain flood reduction benefits to the lower town site.
- Re-establish flow and reduce siltation in the Snye Channel.
- Regularly flush water from the Athabasca River through the Snye.

Golder presented a concept of an Inlet Structure on the Athabasca River that will provide a flow potential of 100 m^3/s through the Snye for an average of 120 days, and a flow potential of 50 m^3/s for an average of 156 days, through the open-water season from May to October. An Outlet Structure consisting of an armoured channel at the east end of the Snye, was also recommended.

Klohn Crippen Berger (KCBL) have confirmed the hydraulic results presented by Golder 2005 and initially developed the preliminary design of the project based on the 10-culvert Inlet Structure and flow targets recommended by Golder 2005. However, review comments from ASRD and DFO in January and February 2007 have indicated that they do not consider re-establishing flow and improving water quality in the Snye to be valid

project objectives. Therefore, from their perspective, the only project benefit, other than maintaining the existing level of flood protection, would be maintaining the capability for navigation through the Snye Outlet.

In order to avoid flows through the Snye Channel with high sediment levels from the Athabasca River, and to avoid the primary fish spawning and rearing periods, KCBL have focused on the implications and feasibility of a single flushing operation through the Snye Channel scheduled for August each year. KCBL also investigated a smaller Inlet Structure and lower flow and velocity targets to address cost and regulatory issues, and confirmed that a 6-culvert Inlet Structure would reliably provide satisfactory flow and flushing velocity during August.

Project cost estimates presented in this report are as follows:

- Option 1, 10-Culvert Inlet Structure, In-situ Concrete $24,000,000
- Option 2, 10-Culvert Inlet Structure, Precast Culverts $14,500,000
- Option 3, 6-Culvert Inlet Structure, Precast Culverts $10,000,000
- Outlet Structure $ 920,000

These cost estimates include engineering and contingency allowances, but do not include annual operations and maintenance costs.

Klohn Crippen Berger makes the following recommendations, based on the preliminary design development presented in this report:

- A preliminary economic comparison indicates that the long term cost of building and operating the proposed Snye Channel structures would be at least double the cost of continuing and improving the annual dredging program, even if annual dredging costs are significantly increased to improve the effectiveness of the dredging program and environmental mitigation measures. Therefore, the continuation and improvement of the dredging program is recommended, instead of proceeding with the design and construction of the structures.

- If the RMWB decides to proceed with the project, the recommended design would be a 6-culvert Inlet Structure utilising precast box culverts (Option 3). Construction of the armoured Outlet Structure should be

deferred until the sustainability of the "natural" outlet channel, with the annual flushing provided by the Inlet Structure, is checked.

- The RMWB should install water level data-loggers during the 2007 open-water season in order to monitor water levels in the Athabasca and Clearwater Rivers adjacent to the Snye. This will provide actual level data to compare with the level data previously derived from river flows and hydraulic modelling.

- Whether the structures are proceeded with or not, RMWB should improve and formalize the dredging program, in consultation with ASRD, DFO and others. This should include a bathymetric survey of the Snye in order to establish the dredging requirements and sedimentation patterns.

Attachment 2

NOTES:

1. ALL ELEVATIONS AND DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE
2. GRID IS NAD83 3TM GRID
3. AERIAL PHOTO WAS TAKEN IN 2005

NOT FOR CONSTRUCTION

1: 5000 0 100 200 m

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED (i.e. 1:1000, etc.) ARE BASED ON 22"x34" FORMAT DRAWINGS.

NO.	DATE	ISSUE / REVISION	DRAWN	CHKD	DESIGN	APVD
A	MARCH 2007	PRELIMINARY DESIGN	MD	TKH	JD	JD

CLIENT: Regional Municipality of Wood Buffalo

Klohn Crippen Berger

PROJECT: SNYE CHANNEL REHABILITATION

TITLE: LOCATION PLAN

SCALE	PROJECT No.	DRAWING No.	REV
AS SHOWN	A03128A01.01.08	D-001	A

CANCEL PRINTS BEARING PREVIOUS

Regional Municipality of Wood Buffalo
Capital Budget Amendment Request
2008

CURRENT PROJECT NAME: Snye Channel Rehabilitation Project
AMENDED PROJECT NAME: Snye Channel Rehabilitation Project
SPONSOR DEPARTMENT: Planning & Development
SPONSOR BRANCH: Engineering Services

Project Amendment

CURRENT PROJECT BUDGET

Select current funding status

Year	*Annual Cost*	*Fed Grants*	*Prov Grants*	*Reserves*	*Operating Budget*	*Other Sources*	*Debenture Financed*
Prior	750,000			750,000			
2008							
2009							
2010							
2011							
2012							
TOTAL	750,000	-	-	750,000	-	-	-

DESCRIPTION/REASONS FOR BUDGET AMENDMENT

$50,000 from the current remaining budget will be needed to carry out bathymetric survey, analysis of the survey results and establish cost estimates to budget for the dredging program.

AMENDED PROJECT BUDGET (Only required if project is new, deferred, or amended)

Amended Priority Score

Select amended funding status

Year	*Annual Cost*	*Fed Grants*	*Prov Grants*	*Reserves*	*Operating Budget*	*Other Sources*	*Debenture Financed*
Prior	161,609			161,609			
2008	50,000			50,000			
2009							
2010							
2011							
2012	-						
TOTAL	211,609	-	-	211,609	-	-	-

Sponsor Department

Project Lead

PLEASE NOTE: Deferred projects must follow the budget process. Deferring a project to a future year does not grant pre-budget approval for that project.

CAPITAL PRIORITY SCORE

Snye Channel Rehabilitation Project

HIGH PRIORITY - Project has incurred costs or will need to start in the first year of the 5-year capital plan

MEDIUM PRIORITY - Project does not need to start until the second or third year of 5-year capital plan

LOW PRIORITY - Project does not need to start until the fourth or fifth year of 5-year capital plan

NOT APPLICABLE - Criterion does not apply to this capital project

		High Yr 1	Medium Yr 2 or 3	Low Yr 4 or 5	N/A	Score
		6	3	1	0	
Criteria						
Health or Safety Issue	7	x				
Legislation Changes	6				x	0
Maintain Existing Assets	5				x	0
Maintain Current Service Levels	4		x			
Increase Efficiencies	3		x			
Increase Level of Existing Service	2					0
New Service	1					0

Total Priority Score 0