OFFICE OF THE
City Auditor

Edmonton Composting Facility Follow-up

January 8, 2007

THE CITY OF Edmonton

The Office of the City Auditor conducted this project in accordance with the *International Standards for the Professional Practice of Internal Auditing*

Edmonton Compositing Facility Follow-up

1. Introduction

This follow-up review was conducted to determine the status of actions taken to address six recommendations contained in the OCA's Edmonton Composting Facility Review, September 2003. The primary objective of the original review was to determine whether the City's purchase price for the composter was a reasonable representation of value. At the time of purchase, City ownership of the composter was forecast to be economical given the purchase price and realized savings based on the actual cost of capital, operating expenses, and revenue. At the conclusion of the audit, appropriate actions were being undertaken to maximize the value of the City's ownership of the composter.

The OCA conducted an interim follow-up audit of the composter in February, 2005. In that follow-up, the OCA reviewed a status report received from Waste Management Branch with the Director of Engineering, Processing & Disposal. In the 2006 follow-up, the OCA received an updated version of the previous status report from Waste Management Branch and reviewed it with the Director. Supporting documentation to the 2006 status report was also reviewed along with a site tour of the Edmonton Composting Facility. Waste Management Branch provided updated operating costs and revenues for the composter, which the OCA then used to re-calculate the Net Present Value (NPV) and Internal Rate of Return (IRR). The OCA also kept abreast of media coverage on the development and construction of the first commercial plant using thermal depolymerization.

2. Background

2.1. Summary of Original Report

The 2003 composter review found that the purchase price for the composter was a reasonable representation of value, given the information available and the assumptions used at the time of purchase. The OCA used actual capital outlays, expenditures, and revenues and re-forecasted results and projections provided by management to calculate a Net Present Value (NPV) and Internal Rate of Return (IRR). At that time, the NPV was $92 million and the IRR was 5.33% respectively. Since the NPV and the IRR were less than the original $97 million purchase price and the cost of capital at 6.38%, the OCA concluded that without changes to its operations, the composter would not meet its original financial targets. The OCA believed that these targets could be met by reducing operating costs and increasing revenues.

The OCA had observed that management was pursuing several options to improve the value of the composter and its economics, such as developing front-end sorting to

improve compost quality, reviewing means of reducing consumption of electricity, and optimising biosolid input. Synergistic projects were also being investigated by management such as the production of energy from the residual waste stream using gasification, pyrolysis, or incineration; selling green-house gas credits; and using the low-grade heat in a greenhouse.

The OCA also reviewed emerging technologies such as thermal depolymerization process and an ecologically based bio-system. The OCA believed that with the construction of a thermal depolymerization plant, co-generation power plant, integrated greenhouse and granulation plant, sod farm and nursery, and the scrap metal and electronics recovery facility, there was potential to use all residuals and compost from the Materials Recovery Facility and the Edmonton Composting Facility. Accomplishing that goal could establish a comprehensive Environmental Technology Park that could supply profits for expansion. If these developments were economically viable, the City of Edmonton could be the first metropolitan area to substantially reduce or eliminate landfilling of municipal solid waste on a basis that is both economically and environmentally sound.

3. Observations

3.1. Current State

The Waste Management Branch has informed the OCA that they have undertaken and initiated several studies and projects to improve revenues and to lower operating costs at the Edmonton Composting Facility.

The Branch reports actions taken to date to enhance revenue are:

- Extending a processing agreement with the County of Strathcona for $900,000 per year,
- Developing waste composting services for animal stables,
- Marketing bulk compost through EcoAg Initiatives,
- Studying the feasibility of separate yard waste collection in support of landfill diversion and production of high quality compost,
- Investigating potential plant retrofits to improve compost quality and increase biosolid consumption,
- Working jointly with the Drainage Branch to further develop “Nutrigold” biosolids to increase the product’s marketability,
- Preparing a package offering of greenhouse gas credits which will go on sale in 2006 and could generate revenues of about $0.5 to $1 million dollars per year, and
- Developing plans for a pre-processing plant next to the Edmonton Composting Facility which could increase the recovery of metals and electronics along with associated revenues from a provincially-managed recycling fund.

In addition, a private developer has optioned industrial land adjacent to the Edmonton Waste Management Centre and has expressed interest in discussing the development of the Environmental Technology Park with the Branch.

The Branch reports actions taken to decrease operating and maintenance costs include:

- Developing an effective joint operations team with the Edmonton Composting Facility's operations contractor to find and implement efficiencies in day-to-day operations,
- Retrofitting air handling equipment to reduce humidity and corrosion,
- Replacing operating parts with parts made of more durable materials to decrease maintenance and repair costs, and
- Taking over the operation of the downstream composting cure site from the contractor to reduce costs and improve the coordination and scheduled shipment of compost to market.

3.2. Engineering Economic Analysis

The OCA provided the Branch an overview of engineering economics principles that could be used to evaluate and select improvement projects for the composter. The Branch has already applied engineering economic analysis to a capital project on organics management and will continue to apply the method to future projects where applicable *(Recommendation #2 – Completed; Appendix A).*

3.3. Revenue and Operating Costs

Since 2003, the composter's annual operating expenses have decreased from $16 million to about $13 million per year. However, operating expenses are still significantly higher than the $9.5 million originally forecast at the time of purchase. Revenues are also significantly below expectations at about $3 million per year compared to the original forecast of $5 million. The OCA recalculated the present NPV and IRR for the composter based on up-to-date actual revenue and costs and found them to be about $85.5 million and 4.5%, respectively. Operating expenses must decrease by another $3.5 million per year and revenues must increase by another $2.0 million per year for the composter to reach its original financial targets. Therefore the overall strategic plan and choice of synergistic projects are crucial if the composter is to achieve a net profit or breakeven position *(Recommendation #1 - In Progress; Appendix B)*. Management highlights that in addition to "profitability," evaluation of composter success needs to include consideration of the environmental benefits the facility provides including reduced environmental liability and extension of in-City landfill capacity. Other benefits included new opportunity for local business, community pride and recognition.

3.4. Development of Strategic Plan

The Waste Management Branch is currently developing an overall strategic plan that is expected to be complete in the first quarter of 2007. The Branch undertook numerous planning studies in developing a strategic plan that treats the Branch's operations as one integrated system. The faster than anticipated access to a provincial grant for the

gasification project and the need to confirm the City's long-term landfill capacity solution are now being integrated into the strategic plan. The composter is a key component in this system, with all other programs tied into to it. The strategy aims to balance the composter operation with related programs to achieve strategic objectives as efficiently as possible. Key factors that the strategic plan addresses include the impact of the Kyoto Protocol, changes in environmental legislation, shifts in urban culture and service delivery needs, increased regulation of Occupational Health & Safety, workforce evolution, and the potential benefits of regional waste management. Management is confident that the strategic plan will describe an enhanced waste management system that includes gasification and which will enable the Edmonton Composter Facility to perform beyond its current capability. Efforts to improve the composter's economy by increasing revenue and decreasing costs will be directed by the strategic plan and will be on-going *(Recommendation #1 - In Progress; Appendix B)*.

3.5. Front-end Processing

An engineering consultant that specializes in waste processing and recycling equipment completed the conceptual facility configurations for front-end processing at the composter. Management then conducted additional analysis to quantify the related costs and savings expected from implementing the proposed front-end processes. Another engineering consultant is currently completing an analysis of the feasibility of integrating pre-processing systems and a new transfer station into the existing composter structure. Analysis to date indicates that significant capital and operational cost savings can be realised by integrating the front-end process and transfer station rather than maintaining separate, stand-alone facilities. It is currently anticipated that detailed design for the integrated pre-processing system and transfer station will be done in the winter of 2006/2007, with tendering to be done in the summer of 2007 and construction to be completed by the end of 2008 *(Recommendation #3 – Completed; Appendix A)*.

3.6. Sod Farming

The Branch conducted an investigation into sod farming and found that there is strong potential for using compost as fertilizer. Local sod farmers had expressed interest in the potential use of compost within their existing operations and in the development of land adjacent to the Edmonton Composting Facility if the City acquires that land. A sod farm feasibility study was undertaken in 2004 and technical trials were conducted in 2005 on two local sod farms. The results of the trials indicated that quality sod could be produced with the use of City compost, but the local producers believed that buying and transporting compost to their existing operations was not economical. The local producers are, however, interested in a joint venture in developing a compost-sod operation with the City should the land in the Clover Bar area be acquired from the Province. The City is still negotiating acquisition of that land as part of a larger land deal. No further investigation of a potential joint venture can be done until the land has been acquired *(Recommendation #4 – Completed; Appendix A)*.

3.7. Granulation of Compost

The Branch conducted a follow-up study after the Alberta Research Council (ARC) conducted trial runs of producing granulated compost using different processes. The results of the ARC research indicate that several available processes can successfully produce granulated compost. Further marketing evaluations need to be done to determine the marketability and consumer safety of commercializing the end product. This opportunity will be pursued over the next few years as resources permit *(Recommendation #5 – Complete; Appendix A)*.

3.8. Greenhouse

The Branch conducted another study in 2004 on the potential for a public-private partnership to develop a greenhouse operation utilising waste heat, compost and a carbon dioxide-rich waste air stream from the Edmonton Composting Facility. A Request for Expression of Interest was issued to determine interest in a joint venture to construct and operate a greenhouse at the Edmonton Waste Management Centre. One formal and one verbal submission were received that indicated interest in future discussions. The Branch needs to conduct further investigation of the possible greenhouse venture in the areas of water supply quality, capital costs, supplemental heating, integrating the greenhouse operation with a private sector partner's other operations, and setting up a small greenhouse pilot project. The Branch should also hold further discussions with local greenhouse operators to determine their degree of interest. The Branch does not plan further investigation of the greenhouse concept at this time because of commitments to higher priority projects *(Recommendation #5 – Completed; Appendix A)*.

3.9. Energy from Waste

The Branch has been investigating advanced thermal processes such as gasification and pyrolysis to produce fuel known as syngas, which can in turn be used to produce heat and electricity. The Branch initially screened over 150 gasification and pyrolysis technologies available worldwide. An additional review of technologies was conducted on the potential use of mechanical, chemical (thermal and biological), and advanced thermal systems (high temperature gasification and vitrification) and 25 emerging technologies available worldwide. The analysis identified five additional companies with proprietary processes that may be technically suitable for processing the residual composter waste. Of these five companies, only two responded to the review's inquiries.

The Branch has concluded that the best prospect at this time is an advanced thermal technology. The selected process is fuelled by shredded and pelletised biomass, municipal solid waste, and organic wastes to produce synthetic gas that can be burned in reciprocating engines to produce electricity at low operating costs. The Branch is currently working with a company to evaluate production of feedstock with the necessary characteristics for its system. The Branch plans to continue with a larger scale test of fuel preparation systems, evaluate potential means of improving process

feed in order to lower costs, and develop a preliminary design of a full scale plant so that reasonably accurate costs can be determined for a detailed business case analysis.

The Branch is currently pursuing its chosen technology as a capital project and has received a commitment for a provincial grant of $29 million. The Branch acknowledges that there are always new technologies under development and will continue to monitor such development, including a thermal depolymerization process *(Recommendation #6 – Completed; Appendix A)*.

4. Summary of Results

The OCA assessed the implementation status of management's actions to address the six recommendations contained in the original report. The following table summarizes the implementation status for those recommendations.

Appendix	Status	Number
A	Complete	5
B	In progress	1
–	Not implemented	–
–	No longer applicable	–
	Total recommendations	**6**

5. Conclusion

One recommendation remains outstanding from the original Composting Facility Audit. The Waste Management Branch is in the process of finalizing a strategic plan that describes an enhanced waste management system that includes gasification and which will enable the Edmonton Composting Facility to perform beyond its current capability. In addition to the environmental benefits, the need to improve the economy of the Edmonton Composting Facility should be included so that it achieves its original forecasted value.

The OCA thanks all City staff who participated in this review for their support, cooperation and feedback.

Appendix A – Completed Recommendations

Original Recommendations	Original Management Response
2. That all future marketing, operational improvement, and preventative maintenance projects be analyzed and prioritised using engineering economic analysis with a Minimum Acceptable Rate of Return (MARR) set at the composter's calculated annual Internal Rate of Return (IRR), plus a premium of 1% to 2%.	Data provided by Management for the analysis conducted by OCA represent conservative estimates of the projected costs and revenue. Management has been actively pursuing ways to increase revenue and reduce operating and maintenance expenses and will continue to do both, using techniques as suggested by the OCA when appropriate.
3. Develop three to five facility layouts for the mechanised tipping floor using industrial engineering facility design methods and simulation to optimize operations.	Recommendation 3 will be pursued bearing in mind the need to remain flexible. Since the layout and function of the tip floor must reflect the needs of key synergistic projects, Management will undertake this analysis once the business strategy is updated (OFI # 1) and investigation of synergistic opportunities such as Recommendations 4, 5 and 6 are complete.
4. Investigate the potential to develop a sod farm and nursery on land that is expected to become available using compost as a growing medium. 5. Investigate the potential to develop an integrated greenhouse and granulation plant utilising an integrated food production system or bio-system similar to that developed by Ocean Arks International. 6. Investigate the potential of Changing World Technologies' Thermal Depolymerization Process and other potential technology to process residual materials from the Edmonton Composting Facility and Materials Recovery Facility in co-operation with regional partners.	Management concurs that there are potential revenue generating synergistic opportunities, including those referenced in Recommendations 4, 5 and 6, which must be investigated. Management notes that the timing for investigation of synergistic opportunities will depend on budget approval for travel (to visit reference facilities and meet with technology vendors) and for consultants' fees (for specialist advice and evaluation). **Planned Implementation Date:** April 2005, July 2006, June 2005, March 2006, October 2006

Appendix B – In Progress Recommendations

Original Recommendation	Original Management Response
1. That the Waste Management Branch update and develop a more comprehensive business strategy and strategic plan that seeks to improve the economy of the Edmonton Composting Facility by increasing revenues and decreasing operating and maintenance expenditures.	Management will update and develop a strategic business plan for the Edmonton Composting Facility in the context of OFI 1 and OFI 2. **Planned Implementation Date:** July 2006

Follow-up Review – Implementation Status:			
___ Complete	**x** In progress	___ Not implemented	___ No longer applicable

Justification for Further Action:

The OCA will review the Waste Management Branch's strategic plan when it has been completed.

Recommendation 1 Revised Implementation Date:	March 31st, 2007